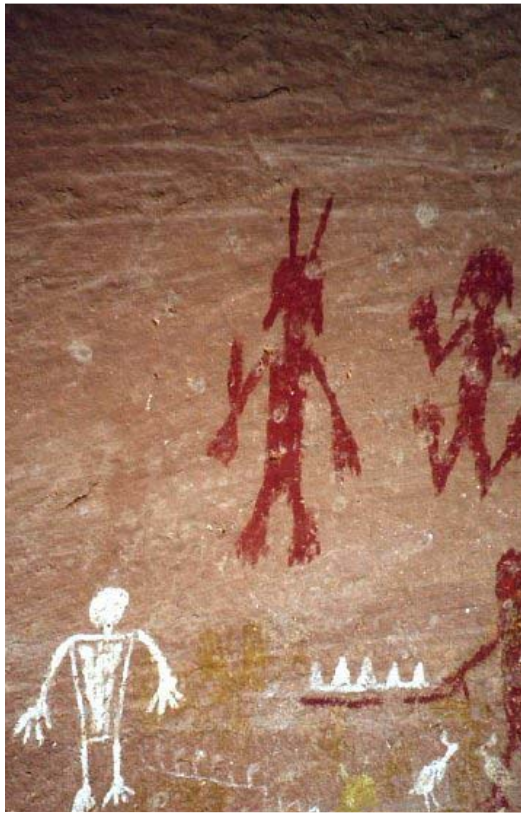
Kayenta Township Comprehensive Plan



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Background and Current Conditions Volume

Kayenta Township, Navajo Nation, Arizona

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Background and Current Conditions Volume

Kayenta Township Comprehensive Plan

Prepared for

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Kayenta Township Comprehensive Plan

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Kayenta Township Commission

Helen Bonnaha, Commissioner
Carol Todecheene, Commissioner
Dolores Greyeyes, Commissioner
Jodonna Hall-Ward, COmmissioner
Rodger Grey, Commissioner
Andre Cordero, Commissioner

Kayenta Chapter Administration

Stanley Clitso, President
Ruth Gilmore, Vice President
Nora Fatt, Secretary
Revaline Tate, Chapter Coordinator

Town Manager

Andre Cordero, Town Manager

Township Department Heads

Selena Begay, Finance Manager
Bradley Blair, Construction Supervisor
Chris Claw, Kayenta Volunteer Fire Department, Fire Chief
Don Jackson, Town Engineer
Ed Whitewater, Director, Economic Development Department
Gabriel Yazzie, Director, Community Development Department
Joann Begay, Parks and Recreation Department
Kee Thinn, Kayenta Police Department
Malcolm Benally, Coordinator CIO, Community Involvement Department
Philbert Tso, Building Official
Shonie De La Rosa, IT Administrator, Information Technology
Scott Benson, Public Work Supervisor

Comprehensive Plan Stakeholders

Navajo Nation Representatives

Katherine Benally, Navajo Nation Council Delegate
Marjorie Clauschee, Navajo Nation Department of Social Services, PSW
Charylene Jones, Navajo Nation Department of Social Services, Case Mgmt. Spec
Grace Kaye, Navajo Nation Housing Authority, Housing Director
Etta Smallcanyon, Navajo Head Start, Coordinator
Lavonne Yazzie, KY District Court, KY Court Administrator
Chester Stanle, KY Peacemaking Court, Peacemaker
Adelle King, Navajo WIC, Program Supervisor
Frank Donald, Jr., NN Workforce Development, Employment Officer
Dorothea Denetsosie, NN Child Support Enforcement, Enforcement Officer

Navajo Tribal Utility Authority

Vircynthia Charley, District Manager
Loretta Todecheene, Customer Service
Jason Tannie, Eng. Tech - Gas
Denny Hardy, Electrical Engineer
Rex Kontz, Deputy General Manager
Gary Yellowhair, Civil Engineer
Wally Chief, Deputy Manager -Technical Services
Caroline Tom, ROW Agent

Navajo County

Jonathan Nez, County District Supervisor
Susie Nelson, Justice of the Peace

Navajo Department of Transportation

Paulson Chaco, NDOT - Window Rock, Director

Comprehensive Plan Stakeholders
(Continued)

Arizona Department of Transportation

Don Sneed, ADOT, Multimodal Planning Division

Kayenta Education

Harry Martin, Kayenta Unified School District, Superintendent
Julius Young II, Kayenta Unified School District, Operations Director
Carol Todecheene, Kayenta Unified School District, Transportation Dir.
Gillian Vormittagg, Kayenta Unified School District, HS Principal
Marti Gilmore, Kayenta Unified School District, KMS Principal
David Hawley, Kayenta Unified School District, KIS Principal
Stenson Wauneka, Kayenta Community School, Facilities Manager
Velma Eisenberger, Kayenta Community School, Principal
Karen Lesher, Native, Superintendent
Phyllis Begay, Dine College, Center Supervisor
Marie Etsitty, Dine College, Interim President
Lorraine Benally, Northland Pioneer College, Center Supervisor
Jeanne Swarthout, Northland Pioneer College, President
Mark Vest, Northland Pioneer College, Vice President
Frankie Gilmore, Native, CTE Coordinator

Kayenta Community Services and Programs

Geraldine Laughter, Women's Shelter, Shelter Director
Linda White, KY - I.H.S., CEO
Harry Sombrero, KY Criminal Investigation, Supervisor
James Ashike, KY Behavioral Health Services, Program Supervisor
Gary Holiday, KY Behavioral Health Services, Family Therapist
Pearlina Chiquito, KY Senior Center, Program Supervisor
Bessie Mitchell, Kayenta WIC, Clinic Supervisor
Dr. Charletta Begay, Kayenta Animal Control,

Business Owners and Residents

Kevin McAuliffe, Kayenta Mobile Home Park, Owner
Travis Honanie, Frontier Communications, Network Engineer
Julene Price, Amigo Café, Owner
Genevieve Crawley, Golden Sands Café, Co-Owner
Richard Mike and Nina Heflin, Burger King, Owners
Richard Mike and Nina Heflin, Hampton Inn of Kayenta, Owners
Eva Workman, Eagle Air Med, Outreach Specialist
Abe Martinez, McDonald's of Kayenta, Owner
Bonnie Frazier, 7-2-11 Food Store,
Kim Forsyth, Conoco Giant Industries
Mark Nicholson, Speedy's, Owner
Gary Curtis, Chevron - NN Oil & Gas, Regional Marketing
Nathaniel Begay, Navajo Nation Shopping Center, CEO
Juanita Yazzie, Navajo Nation Shopping Center, Leasing Specialist
Daniel Fuller, Kayenta Post Office, Post Master
Mike G. Paulowsky, Sonic's Drive In
B&B Consultants Inc.
Tanner Jeffs, Rising Sun Materials, Supervisor
Royal Churchhill, Chief Propane, Owner
Michael W. Eggleston, Ferrell Gas,
Randal Brouchard, Kayenta Chiropractor, Owner - Co
Cheryl Harvey, Kayenta Dialysis,
Ms. Lavina Smith, Kayenta Monument Valley Inn, General Manager
Desiree LaFont Wetherill Inn Best Western, Manager
Wayland LaFont, NAPA Auto Parts, Owner
Fenessa Dayish, Navajo Arts & Crafts Enterprise, General Manager
Gregory and Myra Draper, Draper's Glass, Owners
Paul Frye, Frye Law Firm, P.C.

Comprehensive Plan Stakeholders (Continued)

Dine Bii Association

Edith Widefoot, Assistant Executive Director
Katherine Nez, Program Coordinator
Cheryl Yazzie, Program Coordinator

Sandstone Housing

Victoria Yazzie-Ramsey, Manager
Dana Denny, Director

Community Churches

Daniel Taggart, Kayenta Bible Church, General Director
John Austin, Church of Christ, Preacher
Rev. Norma McCabe, Presbyterian Church, Pastor
Father Jerome Heriff, Our Lady Guadaloupe, Father
LDS Church, President

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Kayenta Township Comprehensive Plan

Kayenta Township, Navajo Nation, Arizona

Kayenta, Navajo: **Tó Dinéeshzhee** is located in northeastern Navajo County, Arizona, about 20 miles south of the Utah border on U.S. 163, 148 miles north-northeast of Flagstaff, and 99 miles west of Shiprock, New Mexico. Because of its remoteness, in the early days the Kayenta region was seldom visited by non-Indians.

Kayenta Township is the only municipal-style government within the Navajo Nation. It is regarded as a political sub-division of the Navajo Nation. The Township is managed by a five-member elected town board, which hires the township manager.

Kayenta is the name for the Chapter, as well as the township. Kayenta Chapter (a political division within the Navajo Nation that is analogous to a county within a state) encompasses land in both Utah and Arizona. As a result, the Navajo Nation's census figures for Kayenta Chapter are significantly different from those of Kayenta Township.

Kayenta is a Census Designated Place (CDP) with a 2000 census population of 4,922. According to the United States Bureau of the Census, the CDP has a total area of 13.2 square miles (34.3 km²). Kayenta is located at an elevation of 5,640 feet (1,719 m).

Major Scenic Attractions

Twenty-seven miles north of Kayenta is the Navajo Nation's most famous attraction, Monument Valley Tribal Park. Betatakin, Navajo for "houses in rock shelves," and Keet Seel Ruins are about 20 miles away. The Four Corners area, a junction of Arizona, Utah, Colorado and New Mexico, the only spot in the United States where four states meet, is less than 80 miles away.

Within a 150- mile radius are a variety of parks and recreational facilities including: Grand Canyon National Park, Glen Canyon National Recreation Area, Lake Powell and Glen Canyon Dam on the Colorado River. The prehistoric Indian dwellings of Canyon de Chelly National Monument and the monoliths and arches of Monument Valley, Rainbow Bridge National Monument and the Navajo Scenic Area are nearby.

Main Gateway to Monument Valley

Located immediately south of Monument Valley, the Township serves as its main gateway, providing a variety of hotels and motels and guided tour services to visitors attracted to the area. The area offers spectacular views of geological formations that have been amply recorded in film, photography and art.

History as a Trading Post

Because of its remoteness, in the early days the Kayenta region was seldom visited by non-Indians. In 1874, Mormon emigrants traveled through on their way from Tuba City to Aneth. In 1910, the first trading post opened at Kayenta. In 1914, the March Pass School opened. In 1916, the second trading post opened. Since that time, especially with road paving through the area, Kayenta has had considerably more traffic and has been designated a "growth center" of the Navajo Nation. Navajos refer to Kayenta as Tohdenasshai.

Major Annual Community Events

The Kayenta Fourth of July Rodeo is an annual multi-day event taking place from July 1–4. Various events take place daily. The "Best of the Best" show and fireworks happen on the fourth.

The Kayenta Fourth of July Rodeo has been recognized six times as the "Rodeo of the Year" and twice as the "Outstanding Rodeo" by the All Indian Rodeo Cowboys Association, making it one of the premier rodeos in the Southwest.

Another major annual community event is the 4th of July Pow Wow. In addition, Kayenta annual events include the Monument Valley Film, Arts and Blues Festival. This Festival is the first and only Native American festival of its kind to be held on the Navajo Nation. The goal of the film festival is to bring Native made films to the people of the Navajo Nation who otherwise would not have the opportunity or means to see these films. It is also an opportunity for emerging and seasoned film makers to present their work to a primarily all Native audience. The festival is also seeks Native blues groups and artists for the opening night Blues Festival.

The Monument Valley Film, Blues and Arts Festival seeks sponsorship from businesses, organizations and individuals for on an ongoing basis. Sponsorship is what keeps this film festival free. Volunteers are also invited on an ongoing basis.

Education

Kayenta is served by the Kayenta Unified School District. Several schools within the district serve the community. Kayenta Primary School, Kayenta Intermediate School, Kayenta Middle School, and Monument Valley High School are the public schools. Part of the Bureau of Indian Affairs, the Kayenta Community School, is a boarding school serving both day and dorm students. There is also a branch of the Diné College in Kayenta. In addition, Kayenta includes the Northeast Arizona Technological Institute of Vocational Studies (N.A.T.I.V.E) District and the North Arizona University (NAU) Kayenta Campus. Educational institutions and school districts are addressed in the Community Services and Public Facilities section of this document.

Community Facilities

Kayenta Township offers a wide range of facilities including a Tribal Chapter House, the Kayenta Field House, five gas stations, a variety of restaurants, rodeo grounds and three gymnasiums, two softball and two football fields at the high school and BIA school. In addition there is a recreation center that includes a softball field. Additional information on community facilities is provided in the Community Services and Public Facilities section of this document.

Utility Companies

Utility companies serving the Township include the Navajo Tribal Utility Authority (NTUA) Natural Gas, Frontier Communications, and Water & Sewer Navajo Tribal Utility Authority. Utility companies and services are addressed in the Community Services and Public Facilities section of this document. There is an adopted Utility Ordinance that requires ongoing coordination with NTUA. Additional information on community facilities is provided in the Community Services and Public Facilities section of this document. Additional information on utilities is provided in the Community Services and Public Facilities section of this document.

Kayenta Airport

The Kayenta Airport is a general aviation airport located in northeastern Arizona. The airport is approximately one mile southeast of the Town of Kayenta immediately north of Highway 160. The airport encompasses approximately 140 acres of land and is owned and operated by Kayenta Township. The airport's primary mission is to serve as a medical evacuation facility. The Kayenta Airport is addressed in the Transportation section of this document.

Kayenta Township Comprehensive Plan

The Comprehensive Plan

The Kayenta Township Comprehensive Plan is a long-range policy document designed to improve the quality of life of the Township. The Comprehensive Plan:

- Includes direction for development, redevelopment, infill development and compact smart growth
- Serves as a guide for decision making
- Includes strategies for redevelopment of decayed areas
- Is a legal state mandate for all Arizona jurisdictions (counties and municipalities) outside of the Navajo Nation.
- Guides the development standards and design guidelines provided in the Zoning Ordinance

As the roadmap guiding development, infill development and redevelopment within the Township, this planning tool includes the vision of the community, a thorough analysis of opportunities and challenges, the policy framework guiding development and the implementation strategies necessary to implement the plan.

The Comprehensive Plan serves as a guide for Township officials in the:

- Evaluation of proposals for development and redevelopment
- Identification of capital improvements projects
- Development of more specific studies.

It includes background data and current conditions and provides a policy framework for the refinement of implementation tools such as the zoning ordinance. It also defines all the administrative and monitoring mechanisms necessary to administer and manage the Comprehensive Plan.

The Comprehensive Plan document consists of two volumes. The *Policy Plan* volume serves as the regulatory document guiding development and redevelopment. This volume includes the community vision, guiding principles, goals, policies and implementation measures.

The *Background and Current Conditions* volume includes an analysis of opportunities and constraints, serves as the backbone of the *Policy Plan* and provides a comprehensive look of the physical, regulatory, demographic, socioeconomic and fiscal conditions impacting development within the Township.

Previous Land Planning Efforts in Kayenta

The form and character of Kayenta Township has been molded by the collaborative efforts of a variety of individuals, a multiplicity of Navajo Nation departments, and a wide diversity of public agencies under the leadership of the Navajo Nation's decision makers. Each planning process undertaken in the past has influenced the character of the community and its sense of place. In addition, such processes have assisted Kayenta in its transition from a rural to a more urban setting. Two major previous planning efforts include the Kayenta Chapter Comprehensive Land Use Plan and the Kayenta Airport Master Plan.

Kayenta Chapter Comprehensive Land Use Plan

A Kayenta Chapter Comprehensive Land Use Plan was adopted by Resolution of the Navajo Tribal Council CN-86-85 in November of 1985. The Comprehensive Plan approved the overall concept of the Land Use Planning Authority and extended local governing capacity to the community of Kayenta, officially designating the planning area as the "Kayenta Township Pilot Project".

The Advisory Committee of the Navajo Tribal Council has the authority to create a Navajo Nation entity by adoption of its Plan of Operation. Under Navajo Tribal Council direction, the Kayenta Chapter undertook the effort to develop a Land Use Plan for the Kayenta Community with the goal of developing an improved local government system that would meet the policies, expectations and hopes of the local residents and the Navajo Nation's policy of decentralizing the Government.

The Kayenta Chapter delegated to the Kayenta Planning Board (KPB) to spearhead this effort. The KPB, with the assistance of the Division of Economic Development, prepared a concept paper which provides a general description of the envisioned local land use planning and the community government recommended for the Kayenta Community and the Kayenta Township Pilot Project.

The Economic and Community Development Committee of the Navajo Tribal Council recommended support of the Kayenta Township Pilot Project concept by Resolution EDCAU-01-85. The Advisory Committee of the Navajo Tribal Council recommended to the Navajo Tribal Council approval of the overall concept of a local land use planning authority and local governing capacity in the community of Kayenta, officially designating the Comprehensive Land Use Plan as the "Kayenta Township Pilot Project" and approving the Plan of Operation for the Kayenta Pilot Project by Resolution ACO-186-85.

Per directive of the Advisory Committee of the Navajo Tribal Council, a map of the proposed land use to be withdrawn was prepared by the Kayenta Planning Board detailing the proposed jurisdiction of the Kayenta Planning Board under the plan of operation. The Navajo Tribal Council approved the concept of local government development, the overall concept of the local land use planning authority, the Plan of Operation and granted jurisdiction to the Kayenta Planning Board over the proposed area contingent upon consistency and compliance with existing policies and regulatory status of the Navajo Nation and the Federal Government.

The Navajo Tribal Council supported the Memorandum of Understanding between the Kayenta Planning Board and the Division of Economic Development and further directed these two entities to coordinate their efforts, as authorized by the Plan of Operation, with all other appropriate Tribal Divisions and Departments.

The Kayenta Comprehensive Land Use Plan was the first phase component of the overall plan for the implementation of the Kayenta Township Pilot Project. It was the product of an extensive process of community involvement and decision-making.

The purpose of the Kayenta Comprehensive Land Use Plan was to include the following:

1. An Open Space Plan which preserves for the people certain areas to be retained in their natural state or developed for recreational purposes.
2. A Land Use Plan which projects future community land needs, showing by location and extent, areas to be used for residential, commercial, industrial and public purposes.
3. A Thoroughfare Plan which improves a system of and provides design criteria for major existing and proposed streets, distinguishing between limited access, primary and secondary thoroughfares, and relating major thoroughfares to the road network and land use of the surrounding area.
4. A Community Facilities Plan which shows the location, type, area served including, but not limited to, recreation areas, schools, libraries, and other public buildings, related public utilities and services.

Kayenta Airport Master Plan

Completed in 2005, the Kayenta Airport Master Plan was financed, in part, by the Airport Improvement Program financial assistance from the Federal Aviation Administration (FAA) as provided under Title 49, United States Code, and Section 47104.
This master plan describes the overall long-range development concept for the Kayenta Airport. The concepts are illustrated in the Airport Layout Plan (ALP). The master plan document includes the data and the rationale that served as the backbone of this report. The purpose of this master plan is to provide guidelines for future airport development that satisfy aviation demand in a financially feasible manner, while balancing the aviation, environmental and socioeconomic impact of the airport in the community.

The primary objectives of the Airport Master Plan are to:

1. Develop a viably phased development plan concept that satisfies the needs of the airport in a safe, efficient, economically and environmentally sound manner.
2. Serve as a guide to decision makers, airport users and the general public for implementing airport development actions in line with both airport and community concerns and objectives.
3. Identify optimum land uses that enhance the economic benefits of the airport and that are compatible with airside development.
4. Prepare a compatible land-use and height restriction plan for the airport vicinity, including recommended zoning protection within the airport influence zone.
5. Prepare a Capital Improvements Plan that schedules development projects and reasonable cost estimates to implement the necessary to implement the Airport Master Plan.

Why is Planning Necessary

Planning, like life, is a dynamic process. Environmental conditions, market forces and individual needs and preferences change over time. As Kayenta continues to change from a rural to a more urban community, it benefits from ongoing planning efforts that acknowledge previous planning processes and addresses changes and trends not foreseen in previous exercises. Such foresight provides the continuity needed to ensure the long-term viability and sustainability of the community. Without a continuous planning process, the future character and sense of place of the community would be determined by a series of unrelated decisions leading to unintended and often undesirable results.

The planning process is a holistic process. It provides a framework by which decisions and actions can be coordinated with other community plans and development proposals. This insures that the end result will be of benefit to the whole community.

As Kayenta stands ready to accept new growth, many new and complex social, economic and environmental opportunities and constraints arise. Such opportunities and constraints must be addressed as they will impact the future of the community. Planning is the process of examining such opportunities and constraints and outlining a plan of action designed to achieve the community vision.

Comprehensive Plan Intent

This Comprehensive Plan seeks to support the community's vision in a manner that ensures the livability, viability and sustainability of the community for generations to come.

This Comprehensive Plan is created to provide specific guidance for Kayenta Township to support its community and to further the rich culture, tradition, identity and economic base of Kayenta as a unique place to live, work, learn, visit and play.

Planning Approach

The Planning Center utilizes a *Comprehensive, Systematic, and Inclusive* (CSI) approach to land planning. This approach allows us to tailor the planning process to meet the unique needs of the community and resolve controversial issues. As part of this approach, we modify the public participation program to meet community needs and include a variety of outreach strategies designed to increase community participation. This CSI approach embraces practical urban design with marketable, innovative ideas owned by the community. By understanding the roles and needs of community members, major stakeholders, Kayenta Township, and the wide array of public agencies involved in the planning process, we assist the community in creating a shared vision.

Benchmarking

Also referred to as "best practice benchmarking" or "process benchmarking", it is a process used in planning and urban design, in which the community evaluates various aspects of their processes in relation to best practices, usually within comparable communities. This process strengthens the planning process by allowing community members to see what has been successful in similar communities.

Analysis of Opportunities and Challenges

This includes a thorough analysis of physical and regulatory opportunities and constraints impacting development within the Township such as hydrology, topography, zoning and airport noise contours. It also incorporates an overview of economic trends and demographic conditions impacting development.

Market and Economic Trends

An assessment of local, regional, state, national and global market and economic trends assists the planning process in strategically formulating a set of goals and measurable objectives that can be implemented to allow the community to gain competitive advantage of current and predicted market and economic trends.

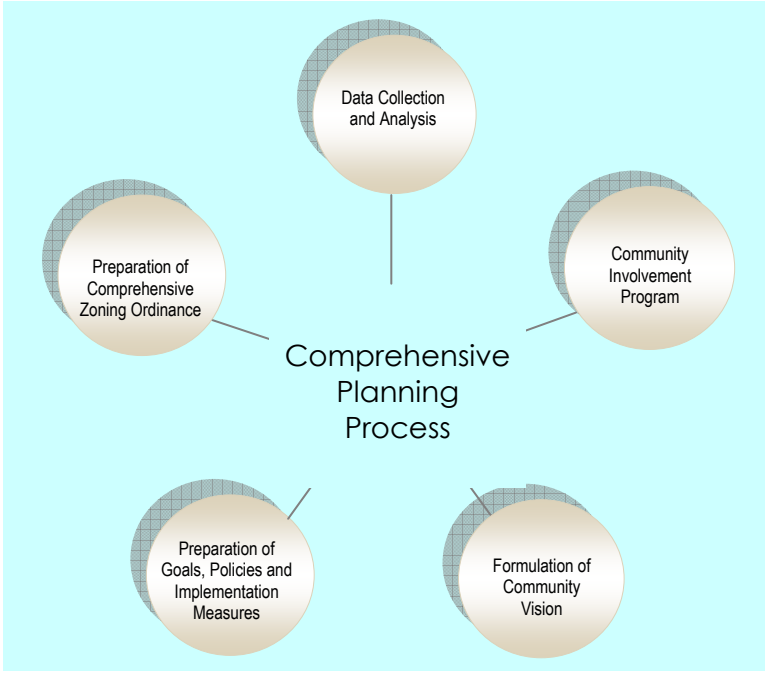
Community Visioning

Provides an opportunity for major stakeholders, residents, business owners, potential investors and developers to create a successful partnership in describing what they would like their community to be in the future. It culminates in the preparation of the Vision Statement that will guide development within the Kayenta Township.

Planning Process

The Comprehensive Plan planning process involves five basic steps:

- The collection and analysis of pertinent data concerning the physical and socio-economic characteristics of the area, which has been accomplished through the preparation of this *Background and Current Conditions* document. Although not an adopted document with legal status, it provides the foundation and basis for the formulation of the Comprehensive Plan;
- The preparation, coordination and facilitation of an all-inclusive *Community Involvement Program*;
- The formulation of a vision statement based on community priorities for future growth and development;
- The preparation of guiding principles, goals, policy framework and implementation measures that serve as the road map for future development; and
- The implementation of the Comprehensive Plan is accomplished through the preparation of implementation measures or strategies that assist in the implementation of action steps.



The Five Legged Kayenta Township Comprehensive Planning Process

Sustainable Planning and Design

This Comprehensive Plan incorporates the latest sustainable design principles to help Kayenta Township become a sustainable destination where community members can live, work, learn and play. Such balanced approach ensures that its environment, economy, society, culture and heritage and technology are preserved and enhanced for future generations. This plan takes the following sustainable design elements into consideration throughout this planning process, and incorporates these elements in the policy framework included in the *Policy Plan* volume.

Environmental Infrastructure

Creating a sustainable community requires balancing economic, social, cultural, environmental and technological forces to ensure the quality of life desired. This process begins with the assessment of the environmental infrastructure. The environmental infrastructure encompasses all the natural resources, renewable and non-renewable, including geology, topography, hydrology, drainage, soils, water, and air. Such assessment provides the foundation for sustainable development and balances natural resources with best practices to create a self sustaining community.

Economic Base

Establishing a revenue generating, vibrant and diversified economic base is a key ingredient in achieving long-range viability. Such economic base capitalizes on providing opportunities for the development of a diversified economic development portfolio that includes: retail/services; ecotourism and heritage or cultural tourism; historic cultural district establishment; and emerging new technologies.

These combined can assist the Township in becoming a sustainable destination where its residents can celebrate culture and heritage, live, work, learn and play and visitors feel the urge to have a longer stay and come back again. Such economic base will allow the community to achieve the quality of life desired.

Social Services

A sustainable community is a place where individuals can work, live, learn and play. Such place offers affordable, convenient and desirable housing, the facilities and services needed to sustain the current and projected population, an integrated health care system, a state-of-the-art education system, a diversified job training program, aging in place opportunities for elders, empowering and engaging youth programs, sacred space for seclusion and spiritual practice, space to celebrate cultural heritage and the arts, the recreation, open space, trails, and connectivity needed to sustain healthy lifestyles. Such a community provides a variety of community services and programs designed to protect, support and sustain its population.

Technology and Innovation

As the high-technology and biotechnology market sectors expand their influence, great attention has been given to creating work environments that support it. Proactively supporting the location of emerging solar and wind alternative energy industries provide an opportunity to create a sustainable energy-efficient community.

Concentrating Solar Power (CSP) offers a utility-scale, firm, dispatchable renewable energy option that can help meet the Nation's demand for electricity. Given the amount of unpopulated rural lands within the Navajo Nation, CSP could supply clean energy to the Nation's growing centers, decrease the reliance on fossil fuels, reduce the carbon footprint, and serve as a viable economic development strategy by connecting into the grid.

Contained Farming Green House

As the Nation's growth centers became more urbanized, agriculture practices receded. Currently there is no agriculture in Kayenta. This implies that all the produce consumed by the community must be transported from somewhere else.

In order to become more sustainable and self-sufficient, the Township may consider permitting contained organic farming as an alternative to more land and water consuming raw crop field agricultural practices. Contained farming occurs in contained environments that increase productivity and product quality while decreasing electricity, land and water consumption and costs. It can be established in the form of community gardens, roof gardens and green houses.

This green alternative provides an opportunity to grow pesticide free, high-quality organic produce at a fraction of the cost of raw crop agricultural practices, which require extensive fields, complex irrigation systems and large quantities of water. Kayenta Township could benefit from exploring and implementing such sustainable technologies.

Sustainability as an Economic Development Tool

Kayenta Township was the fourth community in the country to adopt the *International Green Construction Code*. As a result, the community has been asked to join a work group being facilitated by the International Code Council (ICC) to assist other communities in the nation in the adoption and enforcement of this code.

Sustainable development aims at balancing community needs with environmental infrastructure and ecosystem needs. It focuses on community needs while prioritizing the environment that sustains such community without destroying the ecological systems that sustain us.

This practice focus on meeting the needs of current and future generations in three categories of needs: environmental, social, and economic. Its approach examines the systems required by a project and proactively applies sustainable design principles whenever possible that incorporate U.S. Green Building Council strategies as well as a LEED (Leadership in Energy and Environmental Design) approach. By doing so, the community creates an environment that can also serve as an economic development tool, increasing the livability and viability of the community.

Such practice includes the following strategies:

- Planning and Analyses
- Community Character and Sense of Place
- Sustainable Development Training
- Environmentally Sensitive Site Selection
- Housing Affordability for all Income Groups
- Job Creation
- Geomorphic Grading and Drainage
- Multi-Modal Transportation and Connectivity
- Pedestrian-friendly and Bicycle-oriented Urban Fabric

- Integrated Open Space, Parks, Recreation and Trail System
- Wildlife Corridor Definition
- Urban/Rural Interface Definition
- Optimization of Pervious Surfaces
- Minimization of Heat Island Effect
- Use of Recycled or Harvested Materials
- Stormwater Quantity and Quality Control
- Wastewater Reduction and Reuse/Water Harvesting
- Utilization of Drought Tolerant Plant Palettes
- Landscape Treatments and Streescapes Amenities
- Erosion Control Using Natural Materials
- Onsite Demolition/Construction Recycling
- LEED Documentation for Certification
- Ecological Restoration
- Energy Efficiency/Alternative Energy Generation (Solar, Wind, etc)

At the larger scale, the practice of contained farming as an economic function can provide competitive advantages to economic activities related to ecotourism and heritage tourism. Local restaurants, grocery stores and hotels can benefit from purchasing high quality organic produce at a fraction of the cost. Serving organic produce in restaurants and hotels is becoming an economic trend. Tourists are more health-conscious today than they were decades ago.

Such practice also benefits the community by providing accessible, low cost, high-quality produce within a farmers' market setting. A farmers' market setting can incorporate arts and crafts, creating a new revenue opportunity for community artists, performers, story tellers and artisans. Merging new technologies with heritage and culture is an innovative and low cost way to increase revenues while achieving sustainability and celebrating community pride.

Typical Farmer's Market

Black Mesa, Kayenta, Arizona

Regional Context

Kayenta is located in northeastern Navajo County, Arizona, about 20 miles south of the Utah border on U.S. 163, 148 miles north-northeast of Flagstaff, and 99 miles west of Shiprock, New Mexico.

With an elevation of 5,660 feet, Kayenta's most prominent land feature and reference point is Black Mesa. Black Mesa is located to the immediate southwest of Kayenta and towers above the townsite at an elevation of 8,000 feet at its highest point. In addition to its spectacular scenic beauty and religious significance, Black Mesa contains within its womb an abundance of coal, sizable as a portion of the nation's coal reserve, and rich as valuable resource for the Navajo people.

Kayenta is encircled by a varied and remarkable set of land features: the red faced canyon walls of Skeleton Mesa to the west; the "Five Toes" sandstone hills of the Kayenta Formation to the North; and the solemn volcanic Church Rock and El Capitan rising to the east and northeast. Exhibit 1 shows Kayenta's regional context.

Local Context

Located at the intersection of Highways 160 and 163, Kayenta stands as one of the most remotes communities in Arizona. The nearest off-reservation towns of any significance are at distances of 90 and 130 miles away. Politically, Kayenta lies within District 8 of the Navajo Nation and within the Navajo County of the State of Arizona. Exhibit 2 shows Kayenta's local context.

Physical Environment

A community's infrastructure provides water supply, waste disposal, and pollution control services. It includes extensive networks of aqueducts, reservoirs, water distribution pipes, sewer pipes, and pumping stations. It also includes treatment systems such as sedimentation tanks and aeration tanks, filters, and septic tanks, desalination plants, incinerators and waste disposal facilities such as sanitary land fields and secured hazardous-waste storage impoundments. Such infrastructure serves two important purposes: it protects human health, and it safeguards environmental quality.

On the other end, the physical environment provides a setting, comprises the ecological system, and serves as the environmental infrastructure of a locale or region. It determines the type of development that is most suitable for its characteristics, including climate, landforms, hydrology and drainage, vegetation, view sheds, and wildlife. While the community's infrastructure protects human health and safeguard environmental quality, a balanced environmental infrastructure is vital for the community's long range sustainability and success. The following sections describe Kayenta's environmental infrastructure or physical environment.

Climate and Rainfall

Kayenta's climate is characterized as arid to semi-arid. The prevailing wind direction is from the southwest to the northeast. Based on the National Climatic Data Center from the Betatakin weather station, located 15.66 miles from Kayenta, the annual average precipitation in Kayenta is 12.81 inches. Approximately seventy (70) percent of the water precipitation falls as snow. The wettest month of the year is August with an average rainfall of 1.74 inches. However, most of the annual precipitation occurs between July and the end of October from storms originating on the Gulf of Mexico. The rainfall data's period of record is from July, 1948 to 2011.

Landforms and Topography

The Kayenta Chapter land area is located on the Colorado Plateau at elevations that range from 5,600 to 5,800 feet above sea level. The topography of the greater Kayenta area includes an array of land features, the beauty of which not only distinguishes it within the state of Arizona and the southwestern U.S. region, but it also draws worldwide visitors as an international eco-tourism and heritage tourism destination.

The internationally recognized Monument Valley, thought by some as the *Eight Wonder of the World*, and featured in John Wayne's films, is located twenty-two (22) miles to the north of Kayenta. The topography is defined by the Black Mesa, to the immediate southwest; Skeleton Mesa to the west; the "Five Toes" sandstone hills of the Kayenta formation to the North; and the volcanic Church Rock and El Capita rises to the east and northeast. These mountain ranges encircle the community of Kayenta that lies on the valley floor at an elevation of about 5,600 feet above sea level. Other scenic monuments are Owl Rock, Agathla Peak, Chaistle Buite, Comb Ridge, and Church Rock.

Owl Rock is situated in a petrified forest and is a part of the Chinle Formation. Agathla Peak, Chaistle Butte, and Church Rock are all tertiary volcanic instructive outcroppings located in the north central and north western sector of the Navajo Nation. Agathla Peak, also known as "El Capitan", stands as one of the most prominent of these volcanic outcrops, rising to height of 1,225 feet above the surrounding plains north of Kayenta. Comb Ridge, an exposure of the Red Navajo sandstone, begins its southern ridge just north east of Kayenta and extends in a northeastern direction some twenty to thirty miles. Kayenta is nestled in a unique geological setting. The township area can be generally characterized as a "flat valley" area with a slight plateau rising to the northwest. Exhibit 3 shows landforms and topography.

EXHIBIT 1: Regional Context

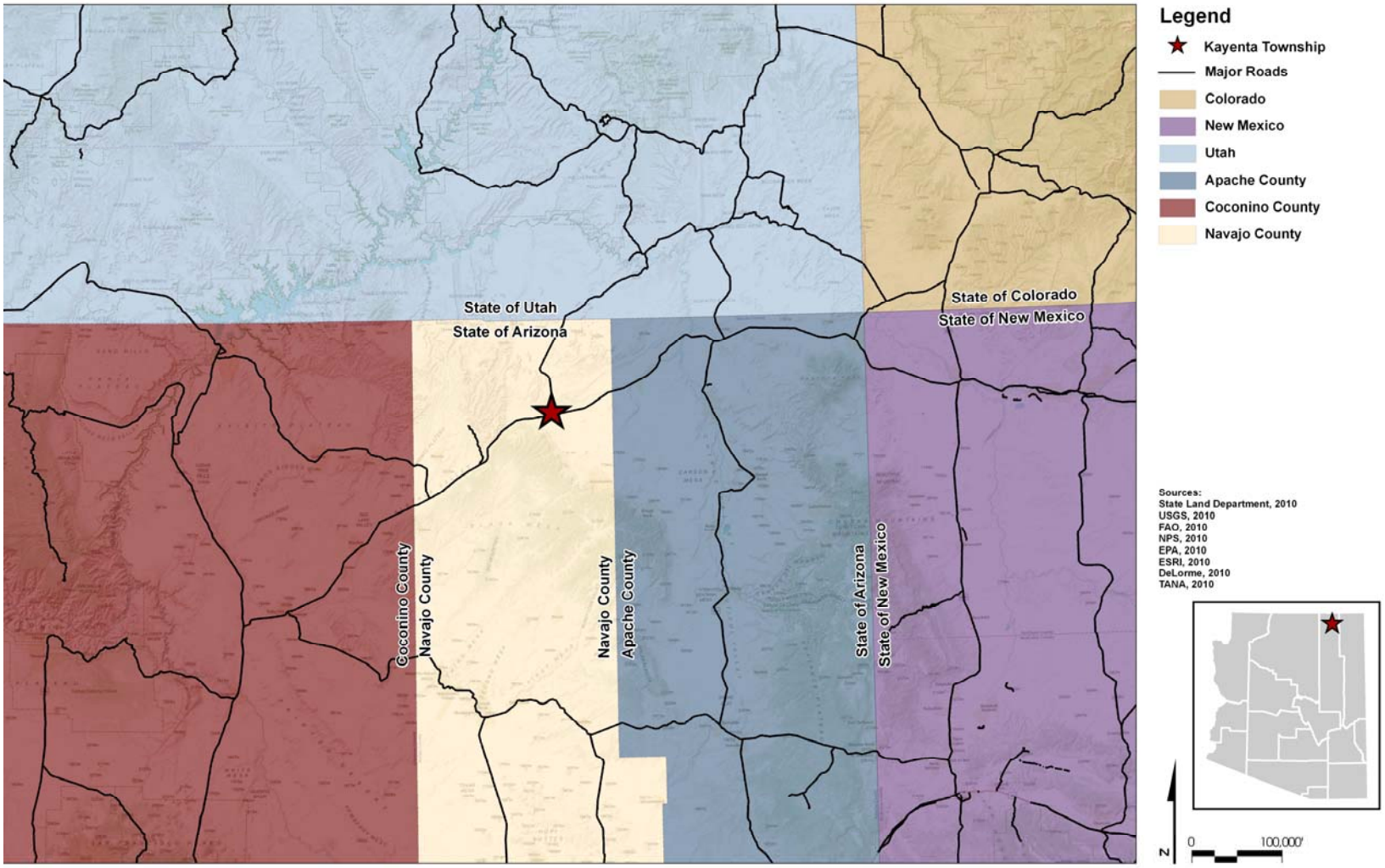


EXHIBIT 2: Local Context

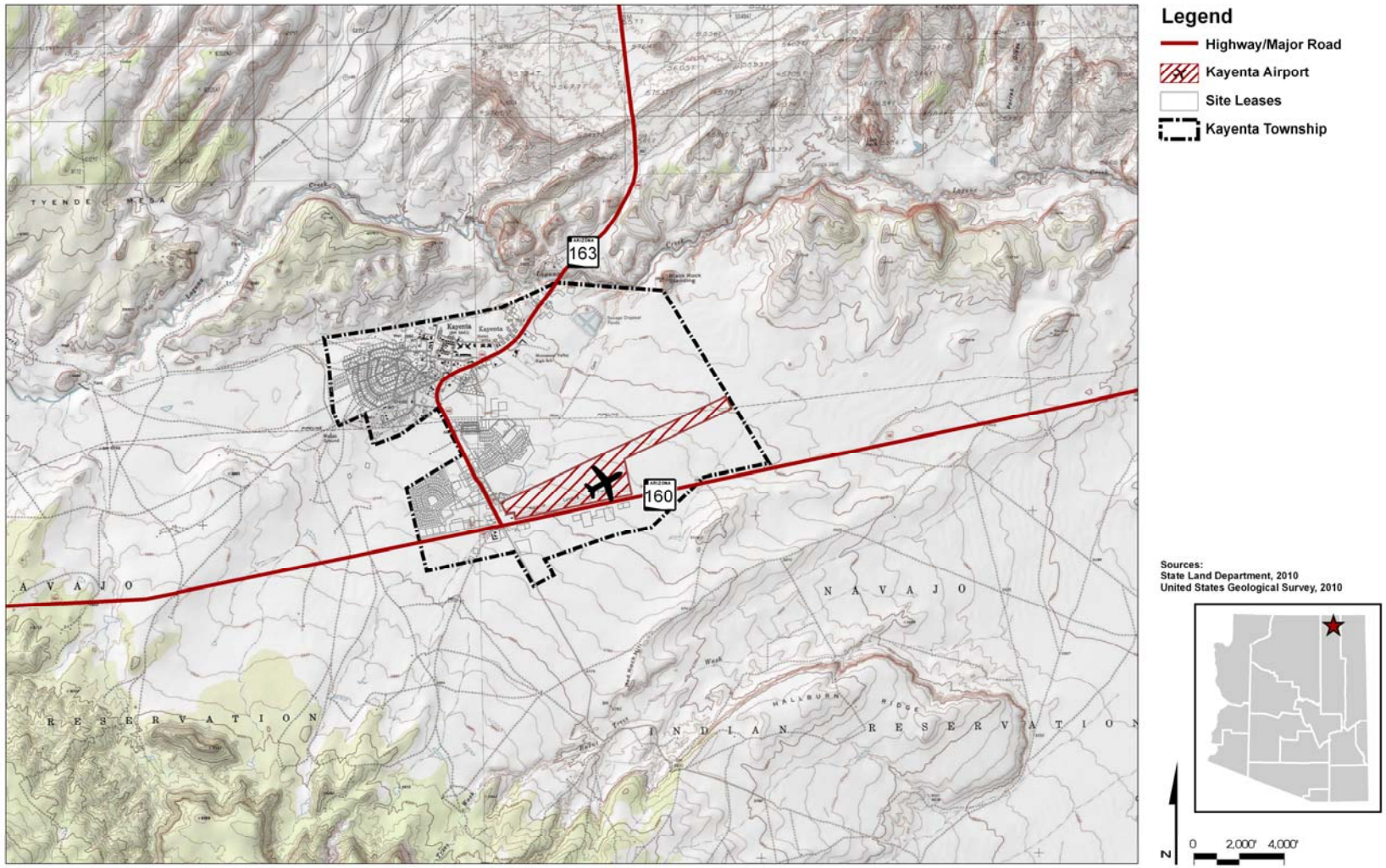
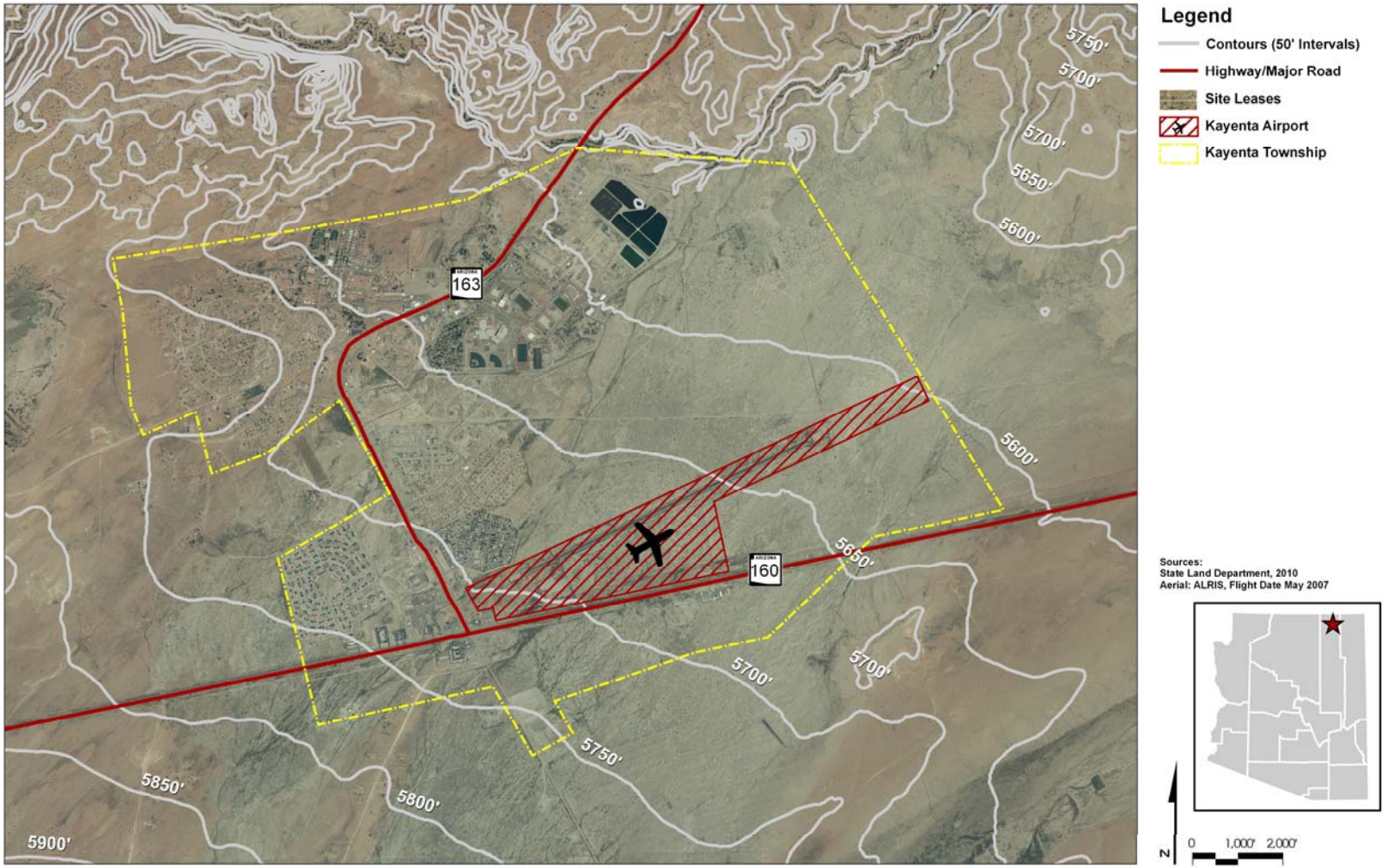


EXHIBIT 3: Land Forms and Topography



Hydrology and Floodplains

In 2011, the Arizona State Land Department and the United State Geological Survey were consulted as part of the preparation of this *Background and Current Conditions* volume. These agencies provided geospatially referenced data for the preparation of Exhibit 4. This exhibit delineates floodplain and washes consistent with 2010 state data provided by the aforementioned agencies.

Methodology

As part of the hydrology opportunities and constraints analysis, the Kayenta Township furnished Arrowhead Engineering, Inc., (AEI) with a copy of the Floodplain Management Study for the Kayenta Community and a paper copy of the corresponding Flood Hazard Area Map.

In addition, AEI utilized GIS data provided by Arizona Land Resource Information System (ALRIS) and available aerial imagery. The Flood Hazard Area Map was scanned into a digital image. The spatial reference for all maps coincides with the ALRIS datum which is NAD83 Arizona East Zone State Plane (US survey foot).

AEI digitized the Q100 floodplain into Civil 3D. Major areas of development that have changed since 1988 were also identified. Exhibit 5 shows the revised floodplain. Exhibit 6 shows new development within the Kayenta Township since 1998. As part of this opportunities and constraints analysis, AIE:

1. Reviewed P\previous studies,
2. Assessed methodologies and input data sources used in the preparation of such studies;
3. Reviewed hydrologic analysis results included in such studies;
4. Assessed recommendations provided at the time the study was conducted;
5. Provided current status for each recommendation included in such studies;
6. Included recommended actions for each recommendation proposed in previous studies; and
7. Identified deficiencies in previous studies.

Previous Floodplain Management Studies

In December 1988, the United States Department of Agriculture Soil Conservation Service prepared a Flood Management Study (FPMS) for the Kayenta Township. The purpose of the FPMS was to derive water surface elevations and frequency estimates. The results of this study were plotted in cross-sections, and subsequently used for mapping flood boundaries and identifying areas within the 100-year floodplain.

The FPMS included recommendations for floodplain management. Since the completion of this study, significant development has occurred in Kayenta.

Methodologies Used

The FPMS used the Soil Conservation Service rainfall-runoff simulation model TR-20 to estimate peak flow-frequency. Hydraulic computations were made using the U.S. Army Corps of Engineers computer program HEC-2. The output from this analysis provided the basic rating relationship for each cross section. The results were plotted on cross sections and subsequently used for mapping flood boundaries.

Data Sources Used

The FPMS utilized USGS 7.5 minute quadrangle for watershed delineation. Roughness coefficients were estimated and mapped in the field. The FPMS recommended utilizing the New Mexico Type II-75 storm distribution. A 24-hour storm duration was considered to provide the appropriate intensities.

Hydrologic Analysis Results

The annual peak flow estimates, resulting from the TR-20 analyses, for selected recurrence intervals and locations are shown in Table 1. These peak discharge estimates are considered to be representative of the land uses in place in 1988.

Recommendations and Current Status

The FPMS recommended local improvements to manage the discharge into the Kayenta Community. The document did not distinguish the responsible party charged with implementing the recommendations. Table 2 provides an overview of recommendations for non-structural measures. In addition, Table 2 includes the current status for each non-structural recommendation.

In the study a more comprehensive system considered the installation of several structural components at five locations where significant damage can be expected. These five areas are discussed in Table 3. This table provides an overview of recommendations for structural measures. In addition, Table 3 includes the current status for each structural recommendation.

FPMS Identified Deficiencies

The purpose of this section is to identify deficiencies in the 1988 FPMS prepared for the Kayenta Community. This assessment was divided into two major components. These two components include the identification of the:

1. Areas where the hydrology changed in Kayenta as a result of new development occurring since 1988; and
2. Data that is deficient in the FPMS.

Development Occurring Since1988

In the last few years, the Kayenta Township has experienced much growth. The major areas of development within Kayenta Township are shown in Exhibit 17, Existing Land Uses, provided in page 130 of this document. The location of major development is summarized on Table 4.

Table 1:
Peak Discharge Estimates
1988

Flooding Source and Location	Drainage Area (mi^2)	Annual Peak Discharge (cfs)			
		10-Year	50-Year	100-Year	500-Year
Stream Channel "A"					
Above Boarding School Tributary	1.66	1280	2330	2760	3680
At outlet into Laguna Creek	2.06	1410	2580	3050	4120
Boarding School Tributary to Channel "A" at outlet	0.14	120	230	280	420
Stream Channel "B"					
At Highway 160	1.61	340	790	1030	1680
Approximately 0.4 miles below dam	2.36	330	770	990	1670
At Highway 163	3.63	410	1060	1390	2490
Above confluence with Channel "C"	4.1	400	830	1050	1420
At outlet into Laguna Creek	11.4	890	2100	2720	4160
Stream Channel "C"					
At Highway 160 Vicinity of Highway 160-163 intersection	3.51	260	740	1020	1570
Above confluence with Channel "B"	6.65	500	1260	1660	2710

Sources: Floodplain Management Study (FPMS) for the Kayenta Community, United States Department of Agriculture Soil Conservation Services, December 1988.

Table 1:
Peak Discharge Estimates
1988
(Continued)

Flooding Source and Location	Drainage Area (mi^2)	Annual Peak Discharge (cfs)			
		10-Year	50-Year	100-Year	500-Year
Channel in Kayenta Public School Complex					
Overflow of old dike	--	25	340	490	1280
At outlet into Laguna Creek	0.41	160	300	420	1130

Sources: Floodplain Management Study (FPMS) for the Kayenta Community, United States Department of Agriculture Soil Conservation Services, December 1988.

Table 2:
Floodplain Management Study Non-Structural Recommendations 1988 and Current Status 2011

Category	Recommendation (1998)	Current Status (2011)	Recommended Actions
1. Flood Hazard Information	Develop flood hazard information to be readily available to the public.	No current Flood Hazard pamphlets or information flyers are available at the Kayenta Chapter House or Kayenta Township Office.	Include policy direction in the Comprehensive Plan to take action on items 1 to 4.
2. Flood Insurance	The Kayenta Chapter may desire to become qualified for the National Flood Insurance Program.	No action has been taken toward this endeavor.	
3. Floodplain Use Regulations	Floodplain use regulations can be imposed to protect those who might consider development in the hazard areas.	No action has been taken toward this endeavor.	
4. Flood proofing	Flood proofing of existing building could provide suitable protection.	No action has been taken toward this endeavor.	
5. Relocation	The study results indicate that it may be most feasible to relocate structures.	Structures were not identified in the study.	Include policy direction in the Comprehensive Plan to conduct a study that identifies all structures within the Township that need relocation and/or retrofitting.

Sources: Floodplain Management Study (FPMS) for the Kayenta Community, United States Department of Agriculture Soil Conservation Services, December 1988. Arrowhead Engineering Current Status Review, 2011.

Table 3:
Floodplain Management Study Structural Recommendations 1988 and Current Status 2011

Locations Where Significant Damage can be Expected	Recommendation (1998)	Current Status (2011)	Recommended Actions
Kayenta Boarding School	Local runoff passed through the school grounds in a shallow depression. There is an existing low capacity pipeline that conveys some runoff though the lower part of the school property. It was decided to consider a pipeline to convey the flood flows through the school, thereby, providing a closed conduit that will give safety to the school occupants. Outlet conditions would require a flood channel to control and convey the floods to a safe discharge point.	Pending field inspection.	
Kayenta Public School Complex	When this school complex was constructed a dike and flood channel was installed along the major lengths of the southern (upstream) edge of the complex. The system was sized such to satisfactorily control what has been determined in this study as the 100-year peak flow. At the head and upstream of this system an older Dike (predating 1970) intercepts floodwater and diverts it into this dike/channel system. This study shows that the older dike will be overtopped by the 100-year flood and that it is in a weakened condition that probably will fail by action of smaller, more frequent floods. Overtopping and/or breaching of this older dike will cause flood damage to the Kayenta Public School Complex and poses the most risk to life of any of the identified problem areas. This study considered the replacement of this older dike and installing a supplemental dike to tie into the adequate dike/channel.	Pending field inspection. Records of replacement or employees involved are very difficult to track down due to the time elapsed.	

Sources: Floodplain Management Study (FPMS) for the Kayenta Community, United States Department of Agriculture Soil Conservation Services, December 1988. Arrowhead Engineering Current Status Review, 2011.

Table 3:
Floodplain Management Study Structural Recommendations 1988 and Current Status 2011
(Continued)

Locations Where Significant Damage can be Expected	Recommendation (1998)	Current Status (2011)	Recommended Actions
The Navajo Housing Project	Flood waters overflowing Highway 163 and along the road drainage ditches are the major sources of damage to this development. The existing diking along the upstream (southwest) edge of this housing along with the culverts under the entrance road into the development are inadequate to divert and control a 100-year flood thereby allowing significant flooding. This examination considered raising the existing dike, extending the diking upstream to intercept flows coming across highway 163, installing larger culverts, and constructing a downstream flood channel to a safe outlet point.	Highway 163 in recent years has been retrofitted to include a major trapezoidal channel on its western side. This channel intercepts all storm water and conveys under US 163 immediately west of the Kayenta Field House via (3) 6'x8' concrete box culverts. The Navajo Housing also has been built up approximately 2-3' in some areas and directs storm water around its development via earthen triangular channels.	
Kayenta Mobile Home PArk	Stream Channel "C" presents a major threat to this trailer court, especially along the southern and southeastern edge of the development. A 100-year flood is expected to inundate about 20 trailer spaces and cause major structural and contents damage to two or three trailers. This study examined a dike to prevent flooding of these properties. Considering that only two or three structures are damaged and that they are readily movable the obvious least cost action is relocation.	Pending field inspection	

Sources: Floodplain Management Study (FPMS) for the Kayenta Community,
United States Department of Agriculture Soil Conservation Services, December 1988.
Arrowhead Engineering Current Status Review, 2011

Table 3:
Floodplain Management Study Structural Recommendations 1988 and Current Status 2011
(Continued)

Locations Where Significant Damage can be Expected	Recommendation (1998)	Current Status (2011)	Recommended Actions
The intersection of Highway 160 and 163	This intersection is vulnerable from the flood flows from three major flow paths. The existing culvert under Highway 160 is inadequate and the culvert installation under the immediate downstream road is very limits. These channel constrictions can be expected to contribute to the major overtopping of both highways during a 100-year flood. The overflow will be shallow but rather high velocities. To protect the commercial facilities in this area a dike was considered to extend upstream from Highway 160, to the south, to prevent overflow of this highway and the Holiday Inn parking area. This diking would train the flow through a new battery of culverts relocated to the west in alignment with the existing downstream channel (this would eliminate the old road/culvert constriction). Another dike would extend downstream (northward) from Highway 160, from the culvert outlet to the turn in the existing channel. This diking would prevent overflow of this channel into the intersection area.	Structures were not identified in study.	

Sources: Floodplain Management Study (FPMS) for the Kayenta Community,
United States Department of Agriculture Soil Conservation Services, December 1988.
Arrowhead Engineering Current Status Review, 2011.

1998 FPMS Deficiencies

The USDA-SCS FPMS is an important document because it serves as Kayenta Township's best available information for floodplain management. Conducted in 1988 and given the growth occurring in the Township since this date, the FPMS is due for an update. As with most historical documents back up calculations or appendices are lost over time. Arrowhead Engineering, Inc. has reviewed the document and finds the following items are necessary to verify the historical calculations and salvage the completed work:

- Scaled maps with delineated watersheds are not provided.
- No datum references were provided in the report or flood map.
- Due to the Flood Hazard Map condition and lack of a datum reference, it was scaled to best fit the aerial survey. The limitation offered by this approach is that the floodplain delineation serves only as a visual representation. It is not an accurately surveyed boundary.
- SCS curve numbers used were not provided in the report, it only mentions that they were estimated and mapped in the field.
- Time of concentration calculations was not provided in the report.
- Rainfall data was not provided in the report, it only states the source being NOAA Atlas No. 2 Volume VIII-Arizona
- Channel's Roughness Coefficients were not provided in the report. It only mentions that they were estimated and mapped in the field.
- Plots of modeled and observed hydrographs were not included in the report.
- Plots of the channel cross sections referenced in the report were not provided only channel profiles are provided.
- Channel flood routing calculations were not provided in the report
- The aerial base map the Flood Hazard Map was generated on is outdated.
- Recommendations for Floodplain Use Regulations were not included in the study.
- Information for the National Flood Insurance Program was not provided.

Floodplain Opportunities and Constraints

Stormwater mitigation and Floodplain management must be considered during any planning effort. Floodplain constraints determine the developable capability of an area. This section includes a discussion of the opportunities and constraints related to floodplain management in Kayenta.

Floodplain Opportunities

Areas Outside of the Designated 100-Year Floodplain
It is anticipated that construction of new buildings and structures in Kayenta Township will occur outside of the designated floodway delineated on Exhibit 5. Properties outside of the designated floodways are not subject to floodplain regulations.

Table 4:
Location of Major Development s within the Kayenta Township
1988 to 2011

Development	Location
Teeh In Deeh Estates	½ mile northwest of the intersection of Highway 160 and 163.
Navajo Housing Authority Project No AZ12-148/150 Tract	1/2 mile northwest on US-163 from the intersection of US-160 & US-163, on the east side US-163.
Kayenta Community School	2 miles northwest on US-163 N from the intersection of US-160 & US-163, approximately a 1/2 mile west of US-163.
Kayenta Unified School District Housing	2 miles northwest on US-163 from the intersection of US-160 and US-163, 1/2 mile east of US-163.
Kayenta Township Offices	0.3 miles northwest on US-163 from the intersection of US-160 and US-163 on the west side of US-163.
Kayenta Recreation Area	1 mile northwest on US-163 from the intersection of US-160 and US-163 on the east side of US-163.
US Post Office	1.3 mile northwest on US-163 from the intersection of US-160 and US-163 on the east side of US-163.
Kayenta Women's Shelter	1.7 miles northwest on US-163 from the intersection of US-160 and US-163, 1/4 mile west of Comb Ridge Rd.
Holiday Inn Additional Rooms	On south west corner of US-160 and US-163.
Hampton Inn Hotel	0.3 miles west on US-160 from the intersection of US-160 and US-163, on the north side of US-160.
Kayenta Dialysis Center	0.1 miles northwest on US-163 from the intersection of US-160 and US-163 on the east side of US-163.
Sonic Drive Inn	0.4 miles west on US-160 from the intersection of US-160 and US-163, on the north side of US-160.
McDonald's	0.2 miles west on US-160 from the intersection of US-160 and US-163, on the north side of US-160.

Sources: Arrowhead Engineering, 2011.

Black Mesa Wash

Areas within the 100-year floodway fringe

It is recommended that floodway fringe areas include recreational uses, open space, and other non-structural uses. Promoting the development of an integrated system of open space, parks and trails in floodplain areas increases the community connectivity, livability and sustainability while providing a circulation system that links neighborhoods, parks, schools, commerce and other recreational and cultural facilities. Such system includes creek way corridors that can support trail development and interconnected parkways or linear parks.

These provide opportunities for the creation of nature trails that include interpretive nodes with a comprehensive signage system describing the geology, wildlife and vegetative communities of the area and including rest areas as well as exercise areas.

Nature trails along floodway fringe assist in the definition of wildlife corridors and provide opportunities for habitat integration. In addition to serving the community with a sustainable amenity, they serve as a community economic development tool, inviting and alluring visitors and enhancing their experience.

Areas within the 100-year floodway

It may be desirable, appropriate and legally permissible to construct some structures such as trail system bridges and observation decks within the designated 100-year floodway. Such structures must comply with all applicable federal regulations. Such structures must be constructed using either cantilever or pier foundations. Any structure placed below the level of the 100-year flood must be flood-proofed, designed to withstand the forces associated with floodwaters and must not impede the flood flow.

National Flood Insurance Program (NFIP)

The NFIP is based on a mutual agreement between the Federal Government and the community. Federally backed flood insurance is made available in those communities that agree to regulate development in their mapped floodplains. If the communities do their part in making sure future floodplain development meets certain criteria, FEMA will provide flood insurance for properties in the community.

Participation in the NFIP is voluntary. There is no Federal law that requires a community to join, although some states have requirements. However, a nonparticipating community faces sanctions, such as:

- Flood insurance will not be available. No resident will be able to purchase a flood insurance policy.
- If the community withdraws or is suspended, existing flood insurance policies will not be renewed.
- No Federal grants or loans for the acquisition or construction of buildings may be made in identified flood hazard areas under programs administered by Federal agencies such as HUD, EPA, and SBA.
- No Federal disaster assistance may be provided to repair insurable buildings located in identified flood hazard areas for damage caused by a flood.
- No Federal mortgage insurance or loan guarantees may be provided in identified flood hazard areas. This includes policies written by FHA, VA, and others.
- Federally insured or regulated lending institutions, such as banks and credit unions, must notify applicants seeking loans for insurable buildings in flood hazard areas that:
    a. There is a flood hazard and
    b. The property is not eligible for Federal disaster relief.

These sanctions make participation a very important decision for many communities. To join the Program, the community must submit an application. Application information is provided on Appendix A.

Floodplain Constraints

Floodplain Management Study (USDA-SCS 1988)

Water flow and drainage patterns have changed in the 23 years since the first Flood Hazard Maps were produced for Kayenta. These changes can be related to land use and erosion or other natural forces.

In the last 23 years, the Kayenta Township has experienced significant growth. An increase in development activity consequently increases the amount of impervious surfaces. Such increase results in appreciable changes in runoff patterns or volume stormwater runoff. These changes can also affect the 100-year water surface profiles and their corresponding floodplain boundaries.

The FPMS prepared in 1988 is a solid foundation to base planning decisions. However, calculations provided in the 1988 FPMS for the Kayenta Community need update to incorporate community growth since the time the study was completed. In order to quantify current Q100 peak discharges, accurately locate floodplain and start a basis for stormwater and floodplain management the FPMS should be updated. Such update should include new hydrology and floodplain calculations based on current and anticipated conditions.

To achieve this, it is highly recommended that the Kayenta Township invite the Navajo Nation Water Resources Department, the Navajo Nation EPA, and NTUA as stakeholders during the 2011 Kayenta Comprehensive Plan community engagement process to begin the conversation on how their respective standards can be implemented, or enhanced to guide future development within the Kayenta Township.

The Flood Hazard Map is a hard copy. The floodplain map was scanned, scaled and visually overlaid to best fit an aerial photo. As a result the floodplain boundaries have limitation to their use as well. The floodplain limits mapped are only for a visual representation. The floodplain limits are not available for survey verification. Flood prone areas will not be field located, platted, or recorded without survey information. An update of the Flood Hazard Map should also be conducted.

Floodplain

According to the Floodplain Management Study for the Kayenta Community (USDA-SCS 1988), the 100-year floodplain, within the study area, inundates about 960 acres. This size of flood will cover about 70 acres of urban land, 110 acres of cropland and 780 acres of rangeland.

As a result, there is significant maintenance and retrofitting costs associated with structures and facilities that are located within areas that flood. The potential for damage or destruction of property by flood makes improvements in these flood-prone areas risky. Funds could be obtained from FEMA for the preparation of a Mitigation Strategy that identifies critical facilities in need of relocation and includes a cost benefit analysis for retrofitting critical facilities in flood-prone areas.

Development of buildings and structures within the 100-year floodplains should be avoided. The areas of the town that are in 100-year floodplains are presented in Exhibit 5 as “Inundated Area 100 Year Flood.” Development in areas of shallow flooding where the average depth is one foot or less should be regulated by floodplain ordinances. The areas of the town experiencing shallow flooding where the average depth is one foot or less are presented in Exhibit 5 as “Average depth Equal or Less Than One Foot”

Stormwater Ordinance

The increase in impervious surfaces causes an increase in runoff beyond that identified in the FPMS. It is recommended that a Stormwater Ordinance be drafted to enable the Kayenta Township to reduce further impact on the surrounding floodplain in these areas.

The most common approach is to require each developer to construct retention and/or detention facilities to restrict the rate at which the increased runoff leaves the property.

A volume of stormwater runoff is required to be stored on the developer’s site. It is released at a restricted rate after the runoff subside (stormwater detention). A developer may store stormwater runoff for irrigation or groundwater recharge or to reduce pollution.

Watershed and Surface Water

The watershed is located in the mixed grass plains and sage brush grasslands sub-resource areas. During periods of high rainfall there is a minimum penetration of surface water because the soil contains exceptionally high concentrations of salt. A list of both indigenous and exotic vegetation is included in the Vegetative Communities section.

The drainage area associated with Kayenta involves eighteen different unnamed channels. Three of these discharge directly into Laguna Creek. Therefore, the watershed area consists of three major subareas:

1. The first major subarea is in the vicinity of Kayenta Primary School and Kayenta Community School. The total drainage area for this watershed is 2.06 mi². (Channel “A”)
2. The second major subarea includes a channel that drains the area around Monument Valley High School. The total drainage area for this watershed is 0.41 mi².

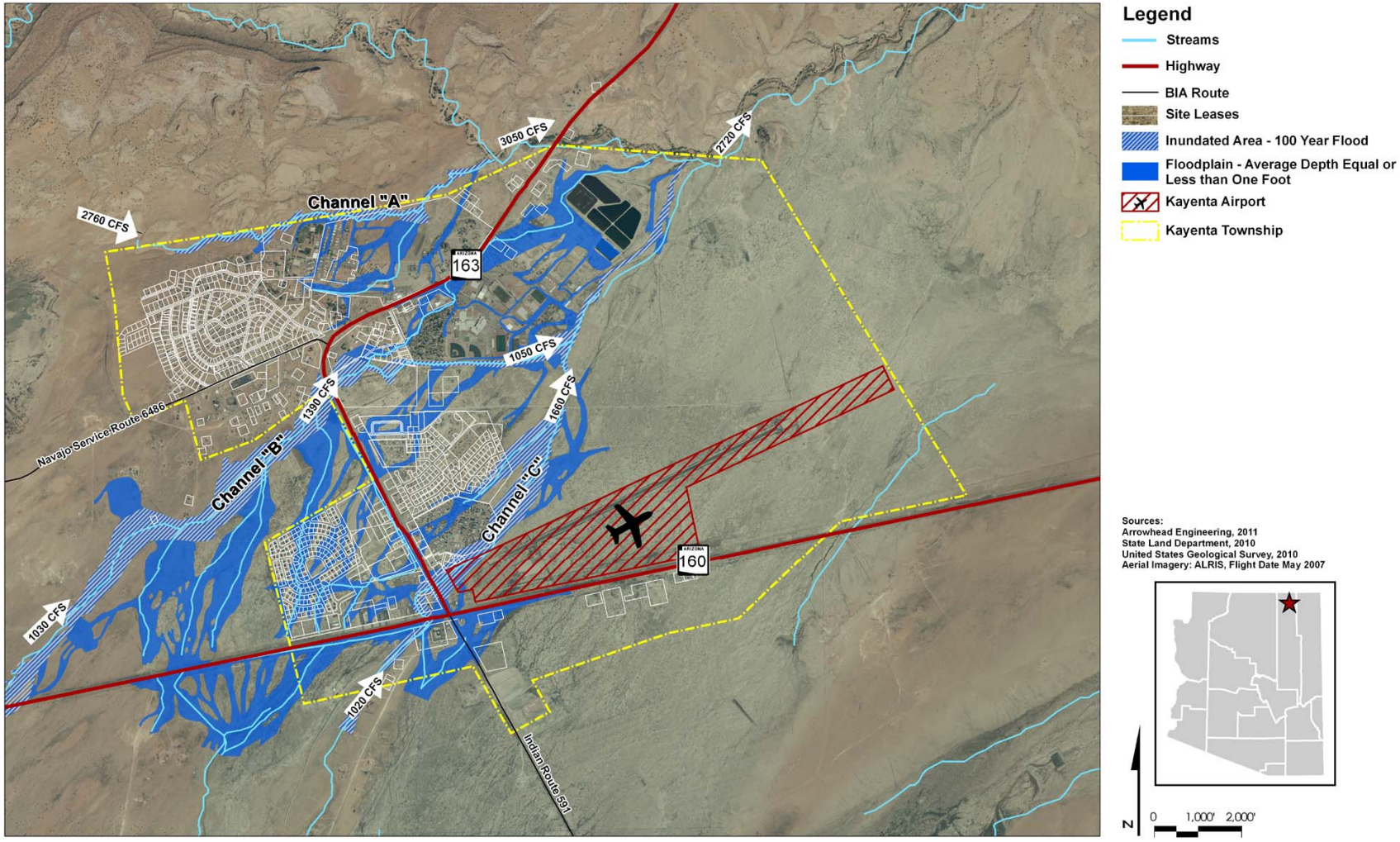
3. The third major subarea is the largest of the three, with a total drainage area of 11.40 mi². This watershed is made up of 15 streams with the longest flow path being 17.97 miles. (Channel "B" and "C".)

Natural watercourses, major washes and floodplain within Kayenta Township's drainage area are shown in Exhibit 4.

Water Resources and Water Quality

Kayenta is located at the edge of the Navajo Sandstone Aquifer which receives its recharge from an outcrop area of about 75 square miles north and west of Kayenta. The Navajo Sandstone Aquifer at Kayenta has a saturated thickness of between six and seven hundred feet. 1998 estimates indicated that the unstatic pump levels were dropping at the rate of ten (10) per 10 year period. The relative location of Kayenta near the northern edge of the Navajo Sandstone Aquifer places a limitation on the absolute capacity of wells to produce water in the immediate area because of the shallowness of the aquifer.

EXHIBIT 4: Watercourses, Major Washes and Floodplain



Soil Associations

Generalized soil associations for the Kayenta area were assessed utilizing Arizona State Land Department and Natural Resources Conservation Services 2010 soil data. Table 5 includes soil types within the Kayenta planning area. Exhibit 5 delineates generalized soil associations within the Kayenta planning area.

Table 5:
Generalized Soil Associations for the Kayenta Planning Area

Soil Association	Slopes
Berryhill family	0 to 3 percent slopes
Cauncelor-Moclom-Hawaikuh complex	1 to 60 slopes
Denzar-Sheppard-Lithic Torriorthents complex	1 to 10 percent slopes
Gotho-Aneth family complex	1 to 10 percent slopes
Rock outcrop-Needle-Lithic Torriorthents complex	1 to 25 percent slopes
Sanfeco-Sheppard complex	1 to 3 percent slopes
Sheppard-Massadona-Monue complex	0 to 10 percent slopes
Sheppard-Typic Haplargids complex	1 to 20 percent slopes
Urban land-Gotho-Tewa complex	1 to 5 percent
Urban land-Nakai Complex	1 to 5 percent slopes

Sources: State Land Department, 2010 and Natural Resources Conservation Service, 2010

The soil types in the Kayenta planning area are characterized by a number of activities, including the formation of active sand dunes and blowouts with accompanying wind erosion. Historically, while these factors cause some hindrance in vegetation growth, there are large sectors of farm land within the Kayenta Chapter. However, as Kayenta moved from a rural to a more urban community, farmlands within the township are sparse and rare.

Vegetation and Vegetative Communities

Vegetation within the Kayenta planning area consists primarily of grama grass, wheat grass, greasewood and shrubs. Scattered piñon-juniper is found in the higher elevations. The rangeland is made up of salt-desert shrub vegetation type with the dominant species consisting of mound salt brush, Russian thistle, Greene rabitbrush, annual weeds, cheat grass and galleta. Shortgrass vegetation type is located on the board, level to rolling plains and mesas at a slightly higher elevation. The dominant species are blue grama and galleta. Exhibits 6 shows generalized vegetative communities.

Wildlife

Wildlife within the Kayenta Chapter area includes deer, rabbits (cottontail and jack rabbit) prairie dogs, coyotes, bobcats and the black footed ferret. Some of the major fowl in the area include the peregrine falcon, the bald eagle, the fenugmous hawk, and the raven, which is the most numerous species. No endangered species of plants or animals were discovered during a field survey conducted in 1981 of the 19.47 acres set aside for construction of the Kayenta Shopping Center. However, the Navajo Fish and Wildlife Department believes that there are certain endangered animal species in other areas of the chapter.

Exhibit 7 overlays all opportunities and constraints described in this chapter.

EXHIBIT 5: Generalized Soil Associations

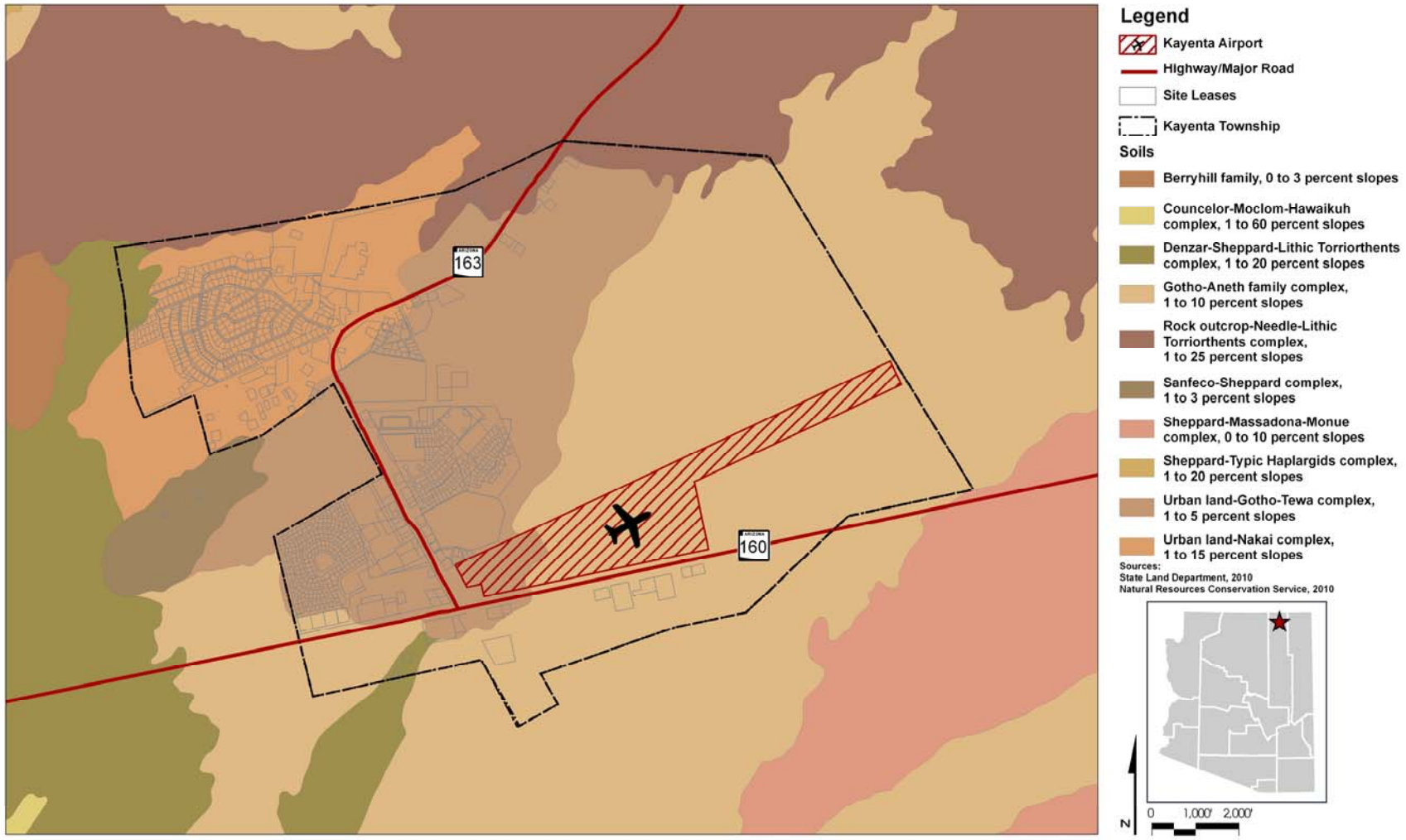


EXHIBIT 6: Generalized Vegetative Communities

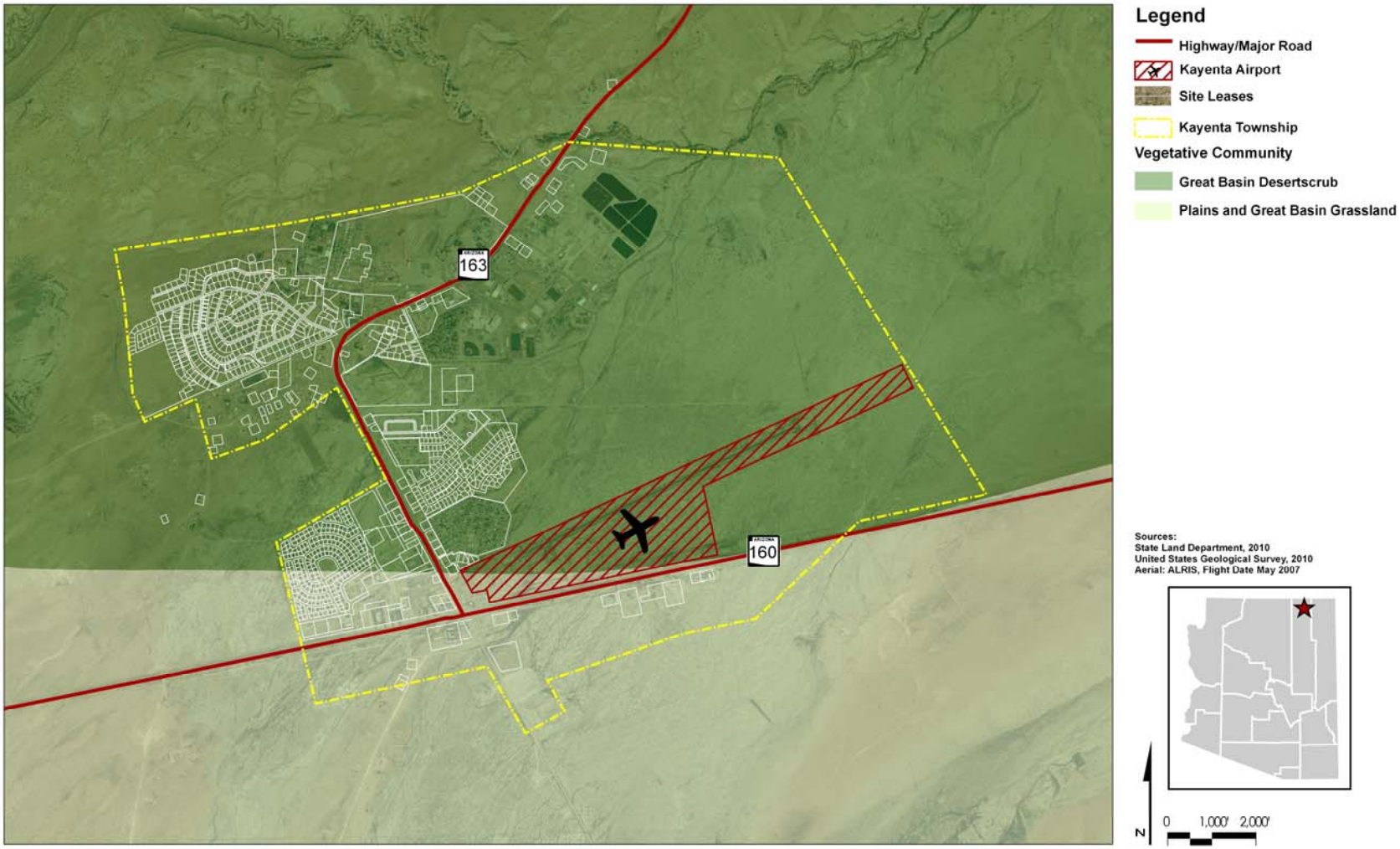
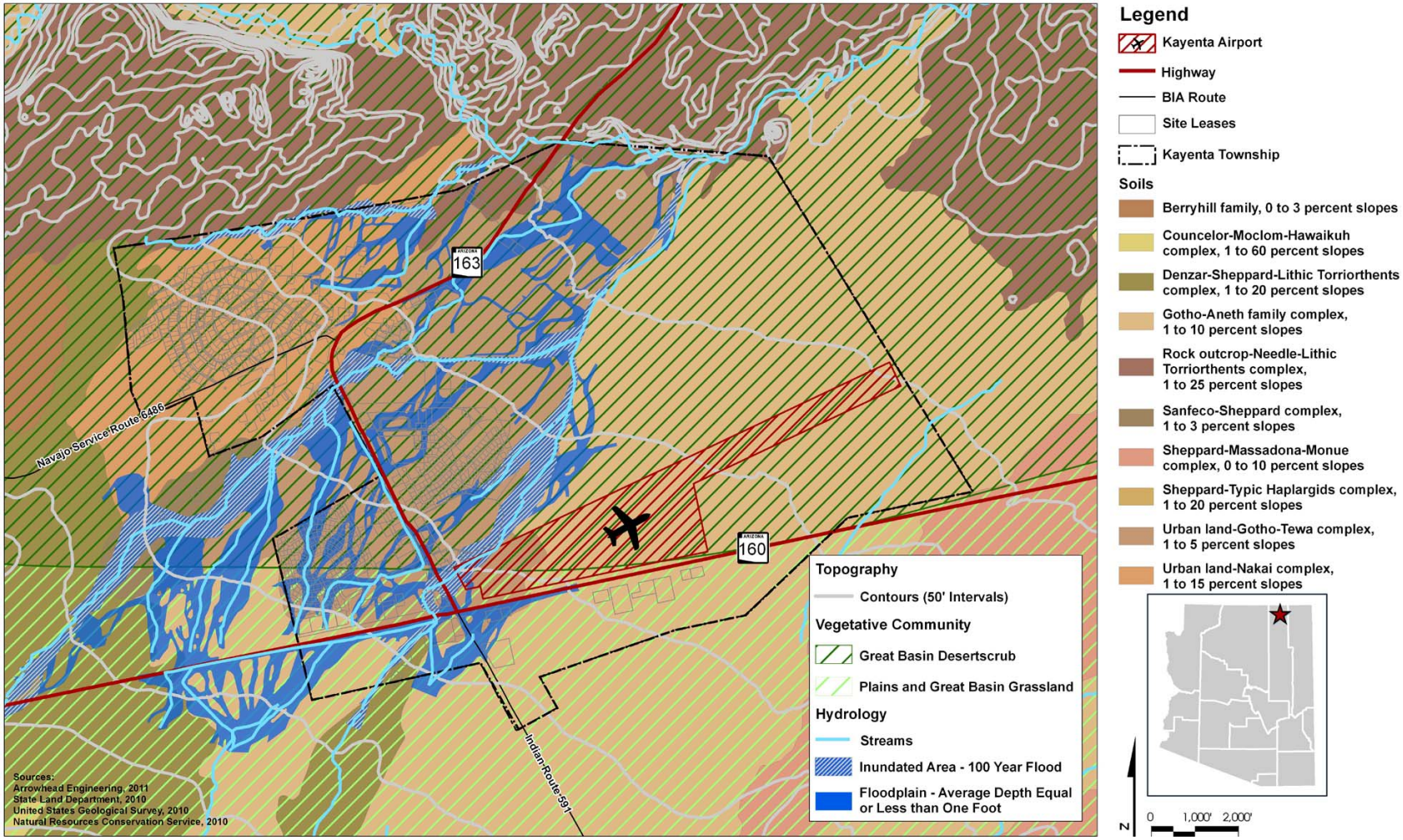
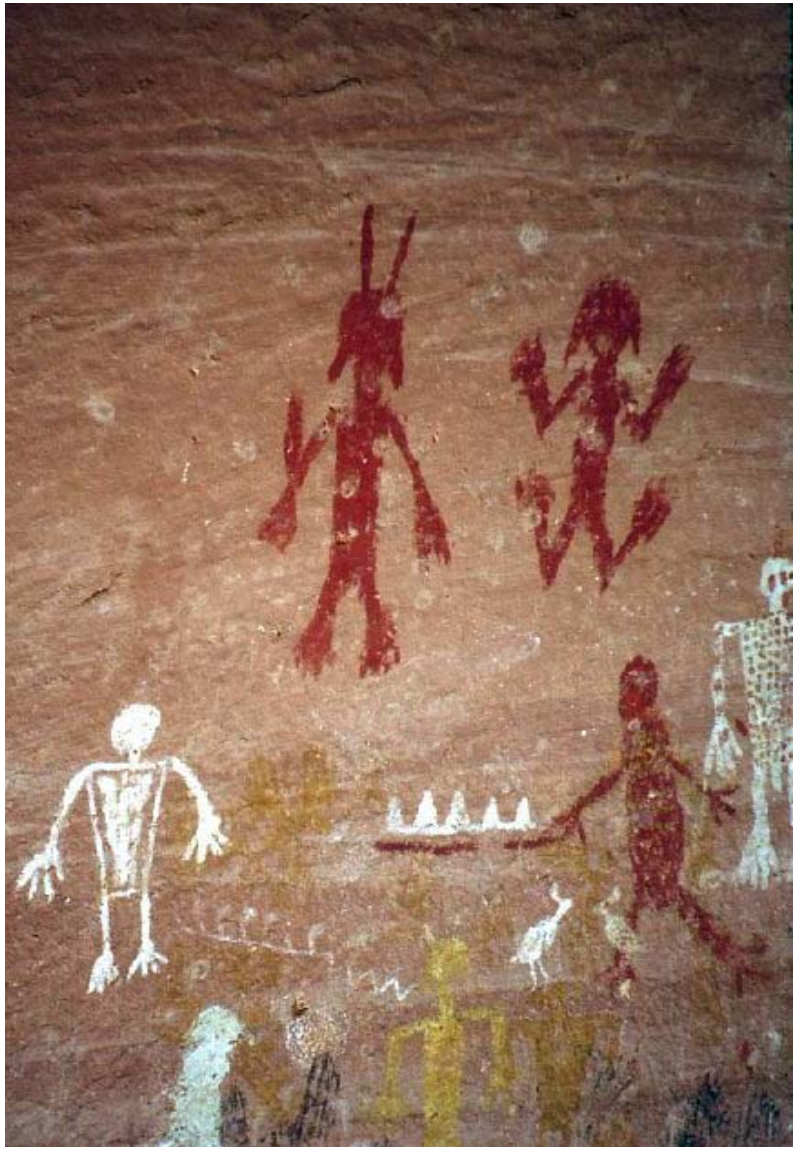


EXHIBIT 7: Opportunities and Constraints





Cultural Resources - Archaeology

There is widespread archaeological evidence of intense prehistoric occupation of the Kayenta region. This is highlighted by the Keet Seel and Batatikin ruins in Tsegi Canyon west of Kayenta. Eastwardly along Combs Ridge are innumerable cliff and pueblo dwellings. Oye House provides a striking illustration of this prehistoric population. Unconfirmed estimates place the Kayenta region at the same period of occupation in the 1100's level as Mesa Verde and Chaco Canyon. Existence of a major kiva comparable to those sites identified at Mesa Verde and Chaco Canyon is unverified. Relatively few sectors of the township area have been archaeologically surveyed. The Bureau of Indian Affairs archives include few survey maps.

Cultural Resources - Historic

The earliest report of European colonists passing within the vicinity of Kayenta dates from 1823 when a detachment of Spanish forces led by Colonel Francisco Salazar came north from the Hopi Mesa and thence eastward into the Chinle Valley to rejoin the main body of Vizcona's Navajo campaign force near Chinle. In 1892-1830 caravans of traders from New Mexico traveled the area going both back and forth from California. During the early 1800's Marsh Pass was called Puerla de Las Lemita, which in Spanish referred to the three leafed siemac that still grows in the region.

In 1885, a group of Mormons, headed by Ethan Pettit, explored the area and traded with the Navajo people. The region was rarely visited by non-Indians until 1874 when another group of Mormons traveling in their wagon from Tuba City to Aneth through Marsh Pass along the San Juan River. For many years after these brief encounters only an intermittent stream of traders and wandering prospectors who disturbed the Navajo and their Paiute allies in the northern sector of the region visited the area.

Kayenta's beginning as a community can be attributed to the first white settlers in the area, John and Louisa Wetherill, who moved from Oljato to Kayenta and built a home and a trading post in 1909. Because of the many springs in the area, the Indians name the site "To-dan-nas-sha" which means in Navajo "Flowing Springs". Two years after the Waterhills settled, a post office was established. Shortly thereafter, work began on the construction of the first school building. A year later the building was completed and named Marsh Pass School.

Coincident to this event was the official naming of the community as "Kayenta" which means "Bottomless Springs". The name was inspired by a large waterhole located approximately five miles west of the town in the Laguna Creek, nearby the current site of the Diversion Dam. The waterhole had a reputation of a drowning site for both humans and animals, some of which were never seen again. Navajo tradition explains the beginning of the "bottomless spring" to have been the home of water monsters, who having lived underground, left the present subterranean caverns when they disappeared.

A number of other developments have contributed to Kayenta's steady growth as a major community within the north central sector of the Navajo Nation. The Diversion Dam was built by the U.S. Works Project Administration in the early 1930's and was soon picked up and enhanced by workers from the Civilian Conservation Corps.

Unfortunately, the onset of World War II halted work on the dam. The dam was conceived and supported as an irrigation project by the Bureau of Indian Affairs whose primary objective was to develop better farming and grazing techniques. Their second objective was to educate farmers and younger residents of the area.

There was interfering with the Diversion Dam project, the older people guarded their traditional methods of farming, grazing and breeding and opposed the "new way" of life. The knowledge of stock raising and land use offered by farmers and stockmen from various parts of nearby states was rejected by the traditional people, resulting in the project's failure. During this period of time, there was one Council member for each district.

The Navajo Nation is also home to the Navajo Code Talkers of World War II. The Navajo language was used to create a secret code to battle the Japanese. Navajo men were selected to create codes and serve on the front line to overcome and deceive those on the other side of the battlefield. These men exemplify the unequaled bravery and patriotism of the Navajo people.

Land Ownership

Land within the Navajo Reservation is owned by the Navajo Nation. Exhibit 8 shows land ownership. A variety of private developments occur within the township in the form of land leases.

The Navajo Nation Council established the Kayenta Township Commission by Resolution CJA-3-96. The Commission oversees leases within the township following the procedures adopted in Chapter 9: Lease and Procedures ordinance (Lease Ordinance). The Commission currently has authority to process business site leases. Home site leases are submitted to the Navajo Nation Land Administration.

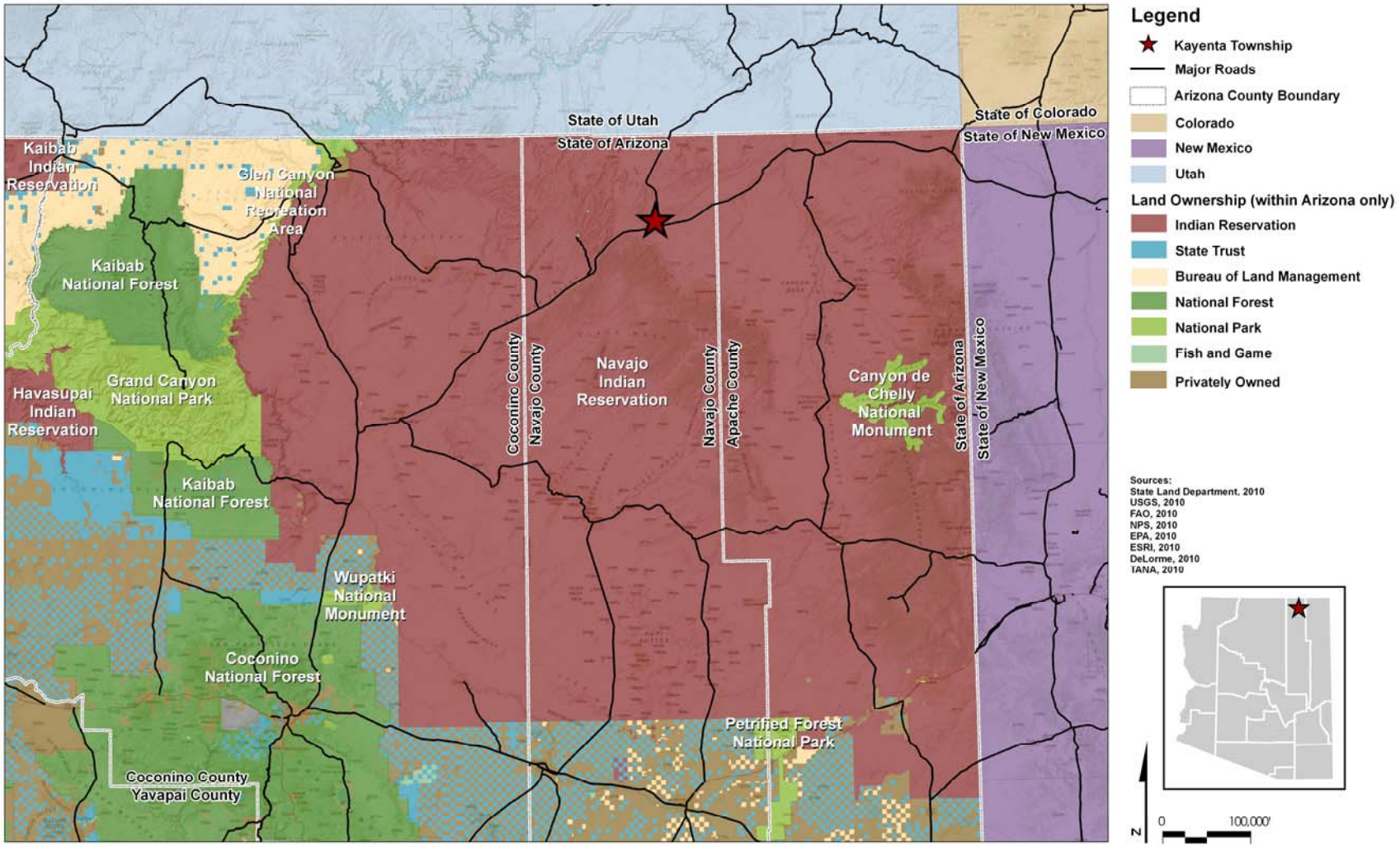
The Lease Ordinance applies to new leases, permits, licenses, right-of-ways and easements executed on or after October 16, 1998 within the Kayenta Township site. It also applies to existing leases where a current lessee wishes to renegotiate a lease, provided that there are no past due rental, or unpaid taxes on the lease.

All new leases involving surface occupancy of land within the Kayenta Township site entered into between the Kayenta Township Commission, Navajo Nation, and any lessee after the adoption of the lease ordinance is governed by the provisions enumerated in it. This includes leases between the Kayenta Township Commission, Navajo Nation, and individual members of the Navajo Tribe. It also includes leases with entities registered with the Navajo Commerce Department or its successors, partnerships and joint ventures between Navajo and non-Navajo entities, and other outside legal entities.

This ordinance also governs leases on previously withdrawn or leased land, including but not limited to industrial parks, shopping centers, trading post sites and other commercial leases. Leases may be granted for a term up to 99 years or less. The regulations included in the ordinance set forth standards for determining the term of a lease.

A developer proposing for the leasing of land within the Kayenta Township site on the Navajo Reservation is required to submit an application for a lease with a development plan, a business plan, and/or financial plan as specified by the Kayenta Township Commission.

EXHIBIT 8: Land Ownership



Community Services and Public Facilities

This chapter identifies the community services and public facilities providing services to the Kayenta community.

Education Services

The growth of the two Kayenta school systems, the Bureau of Indian Affairs (B.I.A) and the state supported public schools have had a direct economic impact on the development of the community and was the community's economic backbone during the 50's and 60's. Since then, the Black Mesa Mines became a major economic development force. The school system will continue to play a significant role in the economic development of Kayenta.

The first school to open in Kayenta was the B.I.A Kayenta Boarding School in 1910. It operated until 1935, when the school closed until 1939 when it reopened as a day school only. In 1955, a new boarding school was built which was later expanded in 1961 to its present size. Since then, the B.I.A. school's enrolment has fluctuated over the years.

The Kayenta Public District #27 began with one school room in 1930. In 1955 the public schools were utilizing classrooms in the new B.I.A. school building. It was not until 1960 that an elementary school was built. The high school was built in the fall of 1964. This facility burned down in June of 1978. Shortly thereafter, construction began on a new high school that was soon completed in the early spring of 1979.

In the spring of 1981, a new middle school was completed on the same site of the old high school. On December of 1982, a new intermediate school began construction. It was completed on January of 1983.

Kayenta Unified School District

The Kayenta Unified District is located in Kayenta, AZ and includes 4 schools that serve 2,179 students in grades PK through 12. The District spends $10,875 per pupil in current expenditures. Of this total, approximately 43 percent is spent on instruction, approximately 52 percent is spent on support services, and approximately 4 percent is spent on other elementary and secondary expenditures.

In terms of student-teacher ratio, the Kayenta Unified School District has 15 students for every full-time equivalent teacher, with the AZ state average being 20 students per full-time equivalent teacher. The Kayenta Unified District had a grades 9-12 dropout rate of 4 percent in 2008. The national grades 9-12 dropout rate in 2007 was 4.4 percent. In the Kayenta Unified District, 10 percent of students have an IEP (Individualized Education Program). An IEP is a written plan for students eligible for special needs services.

The Kayenta Unified District serves 25 percent English Language Learners (ELL). ELL students are in the process of acquiring and learning English Language skills.

Table 6 lists public schools within the Kayenta Unified School District and provides their characteristics. Table 7 lists schools within the Central Navajo Education.

Table 6:
Public Schools within the Kayenta School District 2011

School	Grades	Enrolment
Kayenta Intermediate School N. Hwy 189 Kayenta, AZ 86033	3-5	452
Kayenta Primary School Hwy 163, Kayenta, AZ 86033	PK-K-2	405
Kayenta Middle School North U.S. Hwy 163, Kayenta, AZ 86033	6-8	445
Monument Valley High School Hwy 163, Kayenta, AZ 86033	9-12	876

Sources: U.S. Department of Education, 2011

Northeast Arizona Technological Institute of Vocational Education

The Northeast Arizona Technological Institute of Vocational Education (NATIVE) is a joint technological education district in the Arizona portion of the Navajo Nation. Its programs are available to students at the member schools. The member schools include:

- Chinle High School
- Ganado High School
- Monument Valley High School
- Pinon High School
- Red Mesa High School
- Valley High School (Apache County, Arizona)
- Tuba City High School
- Window Rock High School

Northern Arizona University Kayenta Campus

Northern Arizona University (NAU) includes a Kayenta Campus. This campus includes the following degrees:

- Counseling/School Counseling (MEd) (Masters)
- Educational Leadership - Principal (K-12) (MEd) (Masters)
- Elementary Education (BSEd) (Bachelors)
- Elementary Education-Continuing Professional Emphasis (MEd) (Masters)
- Non Degree - Personal Enrichment (Graduate)
- Principal Certificate (Certificate)
- Reading Specialist Endorsement (K-8) (Endorsement)

Online Bachelor's Degree Programs offered at NAU Kayenta include:

- Certificate in Hotel & Restaurant Management
- Bachelor of Science in Health Sciences
- Bachelor of Business Administration
- BA/BS in Interdisciplinary Studies-Administration of Justice (90/30)
- BA/BS in Interdisciplinary Studies-Emergency Services Administration (90/30)
- BA/BS in Interdisciplinary Studies-Public Management (90/30)

Native Monument Valley High

Native Monument Valley High School is located in Kayenta, AZ and is one of 8 high schools in Northeast Arizona Technological Institute of Vocational Education School District. It is a voc/tech school that serves students in grades 9-12.

Arizona Virtual Academy

The Arizona Virtual Academy (AZVA) is a charter school that gives Arizona kids in grades K-12 the chance to learn in the ways that are right for them. AZVA offers:

- The award-winning K12 curriculum
- Full-time, tuition-free online public school option
- Support from highly qualified, state-certified teachers
- An active, supportive school community
- A range of extracurricular activities
- A robust Advanced Learner Program
- A program that has achieved Adequate Yearly Progress (AYP) six out of the last seven years
- A high school diploma that meets all state requirements for graduates

Chilchinbeto Community School

Chilchinbeto Community School is located in Kayenta, AZ and is in Chilchinbeto Community School District. This school is one of 13 schools in Western Navajo Education Line Office School District. It is a public school that serves students in grades K-8.

Kayenta Community School

Kayenta Community School is located in Kayenta, AZ and is one of 13 schools in Western Navajo Education Line Office School District. It is a public school that serves students in grades K-8. Highway 163, PO Box 188 Kayenta, AZ 86033 (928) 697-3439.

Diné College

Diné College is a two-year, tribally controlled community college, serving the 27,000 square-mile (about 70,000 km²) Navajo Indian Reservation, which spans the states of Arizona, New Mexico, and Utah.

Its main campus is in Tsaile, an unincorporated community in Apache County, Arizona. It also has seven other campuses on the reservation in Arizona (three in Apache County (Chinle, Ganado and Window Rock), one in Coconino County (Tuba City), and one in Navajo County (Kayenta), one in McKinley County, New Mexico (Crownpoint) and one in San Juan County, New Mexico (Shiprock).

The college is directed by an eight-member Board of Regents confirmed by the Government Services Committee of the Navajo Nation Council. The name Diné comes from the traditional name for the Navajo, meaning "the people."

Current enrollment is 1,830 students, of which 210 are degree-seeking transfer students for four-year institutions. The main Tsaile campus includes eight 15-room dormitories housing about 150 students. Each octagonally-shaped unit has a fireplace in the center, and is described by the college as a "hooghan away from hogan" -- a reference to the traditional circular Navajo *hogan* dwelling.

The college first opened in 1968 as the Navajo Community College, the first college established by Native Americans for Native Americans. It was originally housed at the Rough Rock Community School while current location was under constructions. Dr. Robert Roessel was an advocate for the Navajo language and culture. Although Rosessel was white the Navajo had much respect and considered him a Navajo Elder. He stayed at Rough Rock while the College moved to Tsaile.

Dr. Ned Hatathli became the first president of Navajo Community College in 1969 when it relocated to its new location in Tsaile. Dr. Tommy Lewis became president in August 1992. At this time, funding from the BIA was around $4 million a year. Under his leadership, funding from the BIA increased to about $7.3 million a year in 2000.

The usage of the Navajo Language Culture was strengthened and the Board made a decision to use it throughout the institution. Under the 1994 Equity in Education legislation of the US Congress, it became a Land Grant Institution, joining the ranks of the 1864 and 1890 land grant colleges.

During the summer of 1997 the Administration changed their name from Navajo Community College to Diné College to reflect their name for themselves meaning The People. In 1998, Diné College bestowed its first baccalaureate degrees under the Diné Teacher Education Program, accredited under a partnership with Arizona State University. In 1998, the Library was rededicated the Kinyaa'áanii Charlie Benally.

Diné College offers Associate of Arts (AA), Associates of Science (AS), and Associate of Applied Science (AAS) programs. The Center for Diné Studies, applies Navajo Sa'ąh Naagháí Bi'keh Hózhǫǫn principles to advance quality student learning through Nitsáhákees (Thinking), Nahat'á (Planning), Iiná (Living) and Siihasin (Assurance). It also prepares its students by offering courses of the Diné language, history, and culture in preparation for further studies and employment in a multi-cultural and technological world.

The Uranium Education Program at the Shiprock campus is an empowerment program for Navajo concerning radiation and environmental health issues arising from the legacy of former uranium mining/milling operations and other serious environmental impacts on the Navajo reservation.

The Institute for Integrated Rural Development (IIRD) was established in 1996 by the Diné College Board of Regents as part of their Strategic Plan for carrying out their responsibilities as a 1994 Land-Grant Institution. IIRD is charged with developing and administering education, research, economic, and community-based projects that promote and demonstrate sustainability in food production, agriculture sciences, rural community development, health and environment, government, economic development, and natural resource management.

Other Regional Educational Facilities Serving Kayenta Township

Other educational facilities serving Kayenta students are included in this section.

Shonto Preparatory Technology High School

Shonto Preparatory Technology High School also is a state charter high school in Shonto, Arizona. The school is part of the Shonto Preparatory School district, which also includes a K-8 Bureau of Indian Affairs school.

The Indian Affairs education facilities were founded in 1933 out of a local desire to have students attend a school closer to home. It moved to its current location in 1966.

The Shonto Boarding School, as it was called, became a BIA/charter school in 1996, and the charter high school was added in 1997. The school serves students from rural areas such as Black Mesa, Inscription House, and Kayenta, with children being bussed in from as far as forty miles away. The current high school site was built in 2005-06 and includes 17 classrooms, a vocational school, and multi-purpose hall.

The district has 618 students. Of that number, 99.6% are Native American, and over 90% are eligible for free or reduced lunch programs.

Dennehotso Boarding School

The Dennehotso Boarding School is a KG-08 public school. It is one of 13 schools within the Western Navajo Education Line Office District. It is located in East Highway 160 in Dennehotso, Arizona.

Education as a Principal Economic Activity

In 1986, approximately 323 people were employed by the Kayenta Public School system. As provided by the Arizona Commerce Authority, the *educational and health services* economic activity sector in Kayenta employed approximately 3,425 persons in 2008. This economic activity sector is second to the *government* activity sector, which employs approximately 10,800 in Kayenta. The Kayenta Unified School Districts includes 4 schools that serve 2,179 students in grades PK through 12.

Central Navajo Education Office District

The Central Navajo Education Line Office District includes 10 schools. These schools are listed in Table 7.

Table 7:
Central Navajo Education Line Office District
2011

School	Grades	Enrolment
Rough Rock Community School Chinle AZ, 86503	KG-12	563
Many Farms High School Many Farms AZ, 86538	9-12	526
Rock Point Community School Highway 191, Rock Point AZ, 86545	KG-12	500
Lukachukai Navajo Route 13, Lukachukai AZ, 86507	KG-8	469
Chinle Boarding School PO Box 70, Many Farms AZ, 86538	KG-8	445
Jeehdees'a Academy Inc. (Low Mountain) PO Box 1073, Pinon AZ, 86510	KG-8	268
Cottonwood Day School PO Box 6003, Chinle AZ, 86503	KG-8	244
Pinon Community School PO Box 159, Pinon AZ, 86510	KG-12	163
Nazlini Community School PO Box 35, Ganado AZ, 86505	KG-6	125
Black Mesa Community School PO Box 97, Pinon AZ, 86510	KG-8	37

Sources: U.S. Department of Education, 2011

Exhibit 9 shows schools within the region. Exhibit 10 shows schools within the Kayenta Unified School District office.

EXHIBIT 9: Schools within the Navajo Nation Region Serving Kayenta

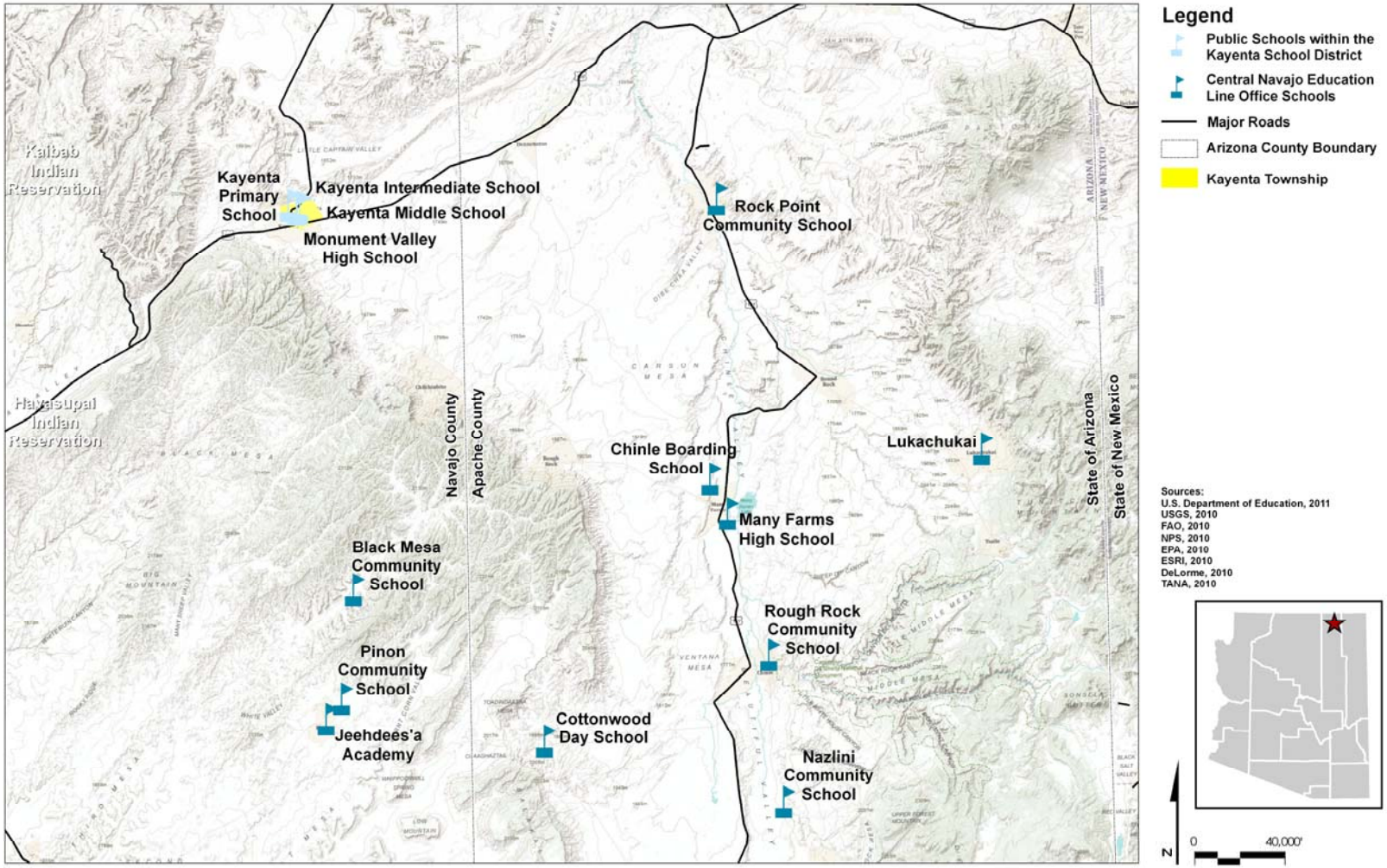


EXHIBIT 10: Schools within the Kayenta Unified School District and N.A.T.I.V.E

Health Care Services

In 1935, the Tuberculosis Sanatorium, a 52 bed facility, opens in Kayenta Township. The sanatorium remained open until January 1944, when it closed due to World War II and the lack of doctors. When the facility was closed, the government asked Mrs. McGaffin, the wife of the Presbyterian missionary, if she would dispense necessary medicines to the sick. After consenting, her services included the taking the very ill to the Tuba City Hospital and Ganado Hospital.

During the 1950's, The Ganado Presbyterian Hospital sent medical teams to Kayenta once a month for medical treatment at the church. Two of three patients were seen during these monthly visits.

In 1959, the U.S.P.H.S clinic was built and became the core for four other clinics which are located in Dennehotso, Chilchinbeto, Inscription House and Shonto. Outpatient medical services, community health and dental services as well as environmental health services are provided out of the Kayenta Clinic. Twenty-four (24) hour, seven (7) day a week emergency services are available at the Kayenta I.H.S. Clinic. Most inpatients were hospitalized at the Tuba City I.H.S. Hospital, 75 miles from Kayenta.

In the spring of 1981, an additional health services facility was established. This facility became the Kayenta Designated Community Health Services (K.C.H.S). This health service facility was obtained through the cooperative efforts of several citizens who saw the need for local medical services for many of the Peabody employees and others who could pay for health services. Outpatient medical and dental services are available at this facility five (5) days a week.

The Navajo Area Indian Health Service (NAIHS) is the primary health care provider on the Navajo Nation. NAIHS program administration is divided into 8 service units: Chinle, Crownpoint, Fort Defiance, Gallup, Kayenta, Shiprock, Tuba City, and Winslow Service Units. Within these service units, NAIHS facilities include 6 hospitals, 9 health centers, 12 health stations, and 18 dental clinics (2007). NAIHS also provides over 50 primary care services at schools and about 60 at Chapter.

Other health care facilities are contract facilities located within or near the Navajo Nation. These include Sage Memorial Hospital (Ganado, AZ), Presbyterian Medical Services (Cuba, NM and Farmington, NM),

Winslow Memorial Hospital (Winslow, AZ), and San Juan Health Care Services (Montezuma Creek, UT). These facilities generated approximately 78,000 outpatient visits and 2,300 inpatient admissions annually. Others are private facilities, mostly small dental clinics, and one private clinic provides family care in St. Michael, AZ.

The Monument Valley Adventist Hospital is located some 30 miles away from Kayenta. This facility is utilized by township and regional residents. Monument Valley Adventist Hospital is a 27 bed facility with 4 doctors, 2 dentists and six nurses. This facility is antiquated and it need of renovation.

As population grew, the outpatient services were delivered in a building that was too small to serve the needs of the population. Multiple trailers were used for health services delivery. In response to a need for additional space, temporary holding capabilities for certain types of emergencies, as well as the need to offer needed services such as a block bank, a blood gas machine, and nighttime support staff, the new Kayenta hospital is under construction. This new facility is being built to accommodate the health care needs of the current and projected populations.

Kayenta Health Care Center

The Kayenta Health Care Center is currently under construction. The Center includes 25 dental chairs, surgery facilities, 13 hospital beds, 129 staff quarters, and 150 new employment positions in addition to current health care staff.

Public Utilities

Navajo Tribal Utility Authority (NTUA) is the major utility provider on the Navajo Nation. NTUA provides service for the community's Water, Sanitary Sewer, Gas and Electric. NTUA is an enterprise of the Navajo Nation. Data, cable, and telephone services are provided by Frontier Communications. The Kayenta Township handles all solid waste through its waste transfer station.

Arrowhead Engineering, Inc (AEI) was commissioned by Kayenta Township to review future and current capacity utilizing existing data. The township's objective is to manage its public utilities by ensuring their capacity to support current and future growth. In general, all utilities will require increased capacity. This section summarizes Arrowhead Engineering, Inc.'s review of the available utility capacity based on data provided by NTUA.

Methodology

The Kayenta Township furnished Arrowhead Engineering, Inc. with digital copies of NTUA's existing infrastructure in Kayenta. In addition, AEI has made use of GIS data provided by Arizona Land Resource Information System (ALRIS), GIS data provided by NTUA, and available aerial surveys.

Based on such data, AEI developed spatially correct utility infrastructure maps. The spatial referencing for the maps are set at NAD83 Arizona East Zone State Plane (US survey foot). These maps overlaid the utility infrastructure onto current color aerial imagery to delineate water, sewer, gas, and electric utilities.

Water System Assessment

The Navajo Tribal Utility Authority (NTUA) Kayenta District operates and maintains the public water system within Kayenta. NTUA is responsible for providing safe drinking water. The water system is intended to serve all areas within the Township Limits, as well as other communities outside the Township Limit.

Presently, the only source of potable water for Kayenta is groundwater from the Navajo Aquifer. The Navajo aquifer is the source of water for industrial and municipal uses in the Kayenta area. "The Navajo aquifer is composed of three hydraulically connected formations - the Navajo Sandstone, the Kayenta Formation, and the Lukachukai Member of the Wingate Sandstone - that function as a single aquifer."(USGS 2010-1038)

The Kayenta Wells Chart, a study completed by the Indian Health Service Engineering Department of Kayenta in 1984, reported the static water levels and pumping capacity (gallons per minute) for each well in the study area. Such study also indicated that the Kayenta water system consisted of seven (7) wells and four (4) water storage tanks at the time the study was prepared. It also reported that the Township was pumping all seven wells at near capacity levels. The pump that served the Wetherill Heights sector pumped 24 hours per day to meet water demands.

The study also indicated that the storage water tanks were located at elevations which did not provide the pressure per square inch (psi) ratings necessary for sprinkler systems in large commercial and public buildings. At the time this study was prepared, Kayenta used approximately five thousand (5,000) acre feet of water per year.

NTUA reports that the township water system currently consists of seven (7) wells that feed into seven (7) water storage tanks, the largest of which holds one million gallons. The current total water storage a capacity is 2,640,000 gallons. There are approximately 98 miles of water distribution lines serving a population of approximately 5,280 people with 983 service connections. Exhibit 11 delineates the existing water system mains.

Water Wells

NTUA provided pump performance data for each existing water well serving the Kayenta water system. Exhibit 11 identifies water well location. Table 8 describes well location and well production capacity in gallons per minute (gpm). In addition to the existing wells list provided by NTUA on Table 8, the Township recently drilled a new well. This well is located southeast of Chief propane.

Currently, the Kayenta well system has the capability to produce 1,298,880 gallons per day (gpd) or 902 gpm.

Storage Tanks

According to NTUA, seven (7) water storage tanks serve the Kayenta water system. The capacity of each storage facility is included in Table 9. Exhibit 11 shows location of storage tanks. Currently, Kayenta has a total storage capacity of 2,640,000 gallons. Exhibit 11 shows existing water reservoirs.

Table 8
Kayenta Township Water Well Location and Production
in Gallons per Minute (gpm)

NTUA Well	Well Location	Well Production (gpm)
1	±600 feet northwest of the intersection of Diversion Dam Rd. and Laguna Wash Rd.	95
2	On the southwest portion of the Kayenta Unified School District parcel in the vicinity of NTUA's substation.	95
3	Approximately 1 mile northwest of the intersection of US-160 & US-163 in the vicinity of the Kayenta Field House.	125
4	½ mile southwest of the intersection of US-160 & US-163.	95
5	1.3 miles southwest of the intersection of US-160 & US-163 and ¼ mile south off of US-160.	225
6	1 mile south of the intersection of US-160 & US-163 on the west side Navajo Route 591.	175
7	Approximately 1 mile east of the intersection of US-160 & US-163 in the vicinity of the Navajo County Office.	92
	Total Well Production	**902**

Sources: Navajo Tribal Utility Authority, 2011

EXHIBIT 11: Existing Water System (Water Mains, Water Tanks and Water Wells)

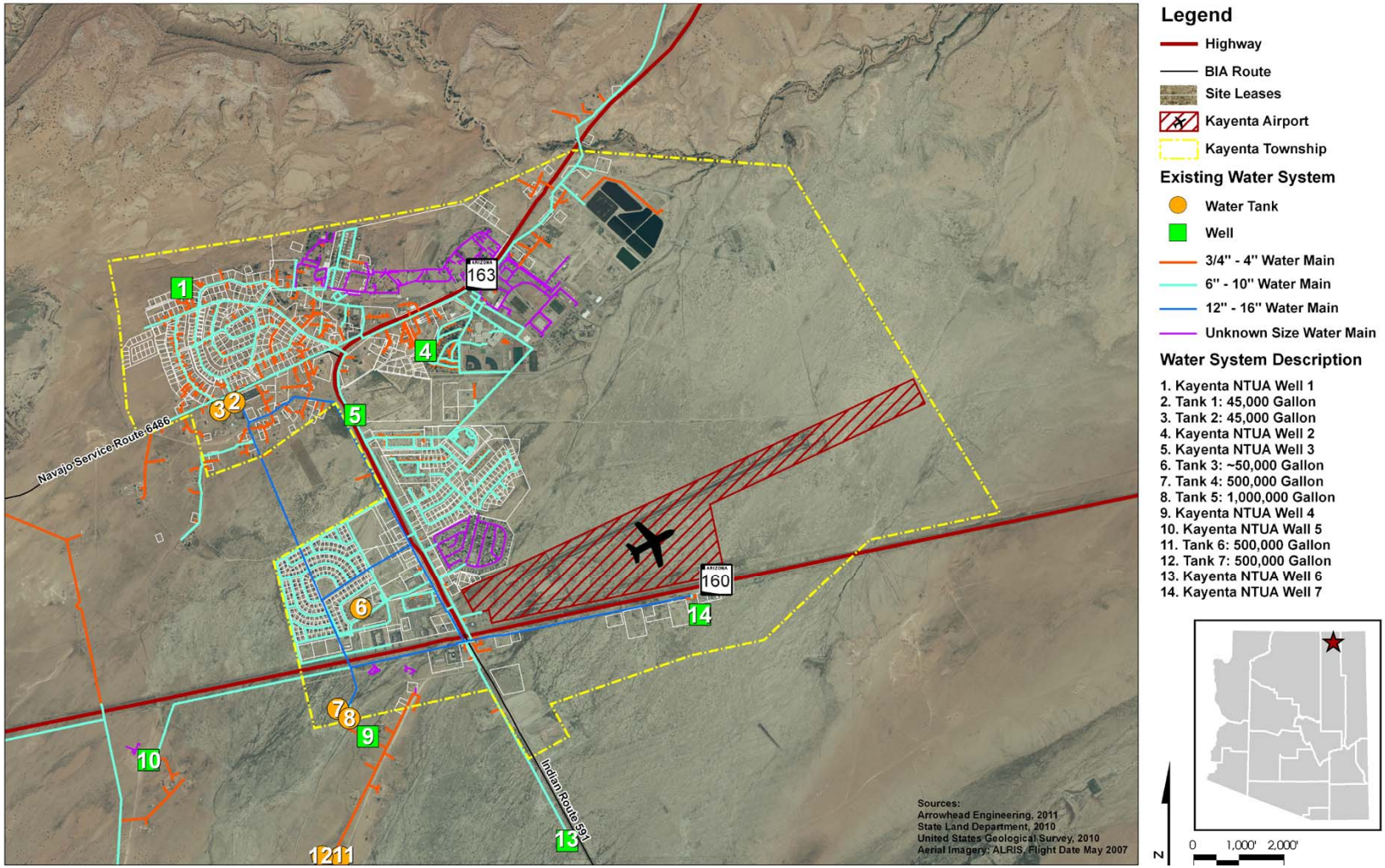


Table 9:
Kayenta Township Water Storage Tank Location and Capacity
in Gallons per Minute (gpm)

Storage Tanks	Storage Tank Location	Tank Capacity (gpm)
1	½ mile southwest of the intersection of Wetherill Rd and US-163 on the south side of Wetherill Rd.	45,000
2	½ mile southwest of the intersection of Wetherill Rd and US-163 on the south side of Wetherill Rd.	45,000
3	Approximately 1/4 mile north of the intersection of Bailey Dr. and US-160 in the vicinity of Kayenta Head Start.	50,000
4	Approximately ½ mile southwest of the intersection of US-160 & US-163.	500,000
5	Approximately ½ mile southwest of the intersection of US-160 & US-163.	1,000,000
6	Approximately 3 miles southwest of the intersection of US-160 & US-163.	500,000
7	Approximately 3 miles southwest of the intersection of US-160 & US-163.	500,000
	Total Well Production	**2,640,000**

Sources: Navajo Tribal Utility Authority, 2011

Water Distribution System

AIE compiled data received from NTUA and Kayenta Township to determine the total length and sizes of pipe within the system. The water distribution system includes differing pipe sizes and pipe materials. Table 10 shows total length in feet per type of pipe.

Table 10
Kayenta Water System Total Pipe Length

Pipe Diameter (Inches)	Total Pipe Length (Feet)
Laterals (Unknown size)	30,326
3/4	156
1	38
2	62,144
4	83,476
6	230,778
8	37,765
10	2,737
12	15,939
16	10,083
Unknown Size	42,990

Sources: Navajo Tribal Utility Authority, 2011

The following data deficiencies were observed:

- Approximately 8 miles of water pipe are identified as having unknown pipe sizes.
- Approximately 6 miles of water pipes are identified as water laterals. These pipe sizes are unknown. They were assumed as being in the ¾-inch to 4-inch category.

According to Table 10, of approximately 98 miles of pipe, about 33 miles (34 %) is 3/4-inch to 4-inch, about 51 miles (53%) is 6-inch to 10-inch, about 5 miles (5%) is 12-inch to 16-inch, and there is about 8 miles (8%) of water pipe identified as having an unknown pipe size.

Water Supply

AEI was not provided with historical records of well production for the NTUA wells. Such records are required to provide and assessment of water supply.

Water Demand

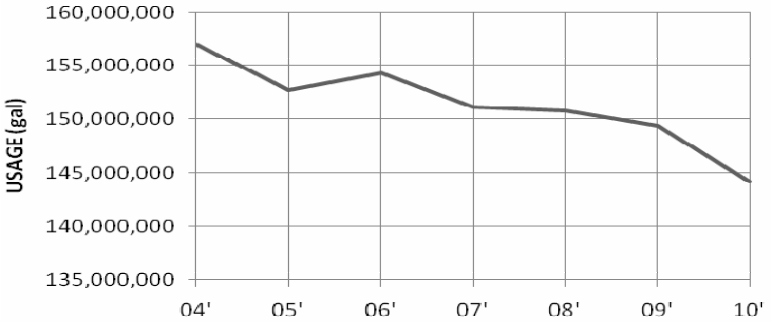
The daily demands for the Kayenta water service area were extracted from the NTUA SAP Consumption and Sales Report, dated 01/01/04 to 12/31/10. The average daily total usage is 414,626 gallons per day (gpd) or 288 gpm. This report will utilize the average usage per day of 288 gpm to calculate the remaining demands.

The following equations were used to determine average day peak month (ADPM, peak day demand (PDD) and peak hour demand (PHD). Figure 1 illustrates the historical usage demand.

- 1.5 average day peak month (ADPM) factor
- 2.0 peak day demand (PDD) peaking factor
- peak hour day (PHD) peaking factor

- Average Day Demand (ADD) = 414,626 gpd = 288 gpm
- ADPM = 1.5 * ADD = 621,939 gpd = 432 gpm
- PDD = 2.0 * ADD = 829,252 gpd = 576 gpm
- PHD = 3.5 * ADD = 1,451,191 gpd = 1008 gpm

Figure 1
Historical Usage Demand



Source: Navajo Tribal Utility Authority, SAP Consumption and Sales Report, dated 01/01/04 to 12/31/10

The historical water usage graphic provided in Figure 1 depicts a significant reduction in water consumption of approximately 13 million gallons of water consumption from 2004 to 2010. Such reduction in water consumption may be attributed to a decrease in agricultural land uses that rely heavily on water irrigation and an increase in urban land uses with lower water consumption rates as a result of steady urban growth. According to Figure 1, there are approximately 13 million gallons of water available for future development.

Total Water Capacity

A comparison between the existing water demand and the total storage capacity indicates that the Kayenta Water System has capacity for the existing land uses. Water capacity necessary to support the land uses depicted in the future land use map is provided in the Water Resources Element of the Comprehensive Plan volume.

ADEQ Bulletin 10, standards, recommends water for one day of average day peak month is recommended for storage sizing. Fire flow is not provided and not included in the storage calculations. The ADPM is 621,939 gallons. Kayenta has a total storage capacity of 2,640,000 gallons per Table 9, and can provide approximately 4.2 days of storage for the system, which is 4.2 times the minimum sizing requirement.

Water System Opportunities

The Kayenta Township is in a unique position. The Township infrastructure is provided by an independent entity outside of township government. This creates opportunities for interagency agreements as well as for capital improvements coordination and prioritization. It also provides an opportunity for NTUA to be involved in the preparation of the Kayenta Township 2011 Comprehensive Plan and Zoning Ordinance from its early stages. NTUA can provide valuable insight with respect to planned growth criteria and capitol improvements priorities.

Water System Constraints

There were no records provided describing the relationship between Kayenta Township and NTUA, regarding planned future development in Kayenta.

Wastewater Treatment System Assessment

NTUA Kayenta district is responsible for collecting and treating wastewater or sanitary sewer within the Kayenta Township. Kayenta utilizes a lagoon sewerage treatment system. NTUA also performs all water quality testing, chemical composition analysis, and performs maintenance of the treatment plant, aeration ponds, pumping stations, piping systems, and other sewage treatment facilities. Exhibit 12 shows Existing Sewer System.

The Kayenta community wastewater treatment facility provides services to all education facilities, commercial and housing areas. Six stabilization ponds are located northeast of Kayenta Public School. The effluent from the lagoon is filtered and chlorinated to 100% purity before being discharged into the Laguna Wash. Part of this discharged wastewater is utilized by the Kayenta School District to water their football field and lawns.

To maintain the 100% water purity, water samples area taken each month for analysis. Estimates indicate that the sewer system can handle twice the current load. NTUA avoids the use of lift stations because of significant maintenance costs. Lift stations are only used when the wastewater nears the lagoons. The system is dependent on gravity flow. Unconfirmed observations concerning the east central sector of the township indicates this area to be lower than the sewer lagoons.

Existing Wastewater System Collection and Treatment

The NTUA-Kayenta wastewater treatment lagoon facility is located in north east side of town, east of US-163. The Kayenta Lagoon Wastewater System encompasses approximately 37 acres, with facilities that include the headworks, aeration ponds and percolation ponds.

The treatment plant consist of six facultative lagoon operated in series. Currently only two (2) ponds out of the six (6) are being used. The only pretreatment of wastewater flows at this facility is a barscreen with a two-inch opening. There is an influent gate box that can direct the influent flow to either cell 1 or to cell 2. The lagoon system is equipped with ultra-sonic meters to measure the influent and effluent. Effluent is chlorinated and discharged from an 8-inch pipe from Cell #6 to a discharge outfall, to Laguna Wash.

The daily Influent and effluent flows for the Kayenta wastewater treatment lagoon facility were extracted from the NTUA Daily Flow Records, dated January 2011.The Kayenta Lagoon System currently treats an average daily flow of 0.53 mgd with a design capacity of 0.9 mgd and an average effluent flow of 0.286 mgd. The lagoon system currently has an average daily storage of.245 mgd or 32,710 cubic feet per day.

Distribution System

AEI compiled data received from NTUA and Kayenta Township to determine the total length and sizes of pipe within the system. The sewer system includes differing pipe sizes and pipe materials. Pipe length and diameter is shown in Table 11.

Table 11
Kayenta Wastewater System Total Pipe Length

Pipe Diameter (Inches)	Total Pipe Length (Feet)
3"	178
4"	12,358
6"	16,424
8"	68,509
10"	21,077
12"	25,891
16"	1,928
3"	178
4"	12,358
6"	16,424
8"	68,509

Sources: Navajo Tribal Utility Authority, 2011

As provided on Table 11, of approximately 28 miles of pipe, about 2 miles (9 %) is 3-inch to 4-inch, about 20 miles (72%) is 6-inch to 10-inch, and about 5 miles (19%) is 12-inch to 16-in.

Wastewater System Opportunities

The NTUA sewer lagoon is near capacity while the Township is proposing several large scale projects in the immediate future. In order to provide adequate wastewater treatment capacity, the preparation of a Wastewater System Master Plan is recommended. The 2011 Comprehensive Plan provides an opportunity to include the policy direction needed to prioritize wastewater system capacity improvements. NTUA's involvement in the 2011 Comprehensive Plan is highly recommended.

Wastewater System Constraints

Regulatory and Permitting Requirements

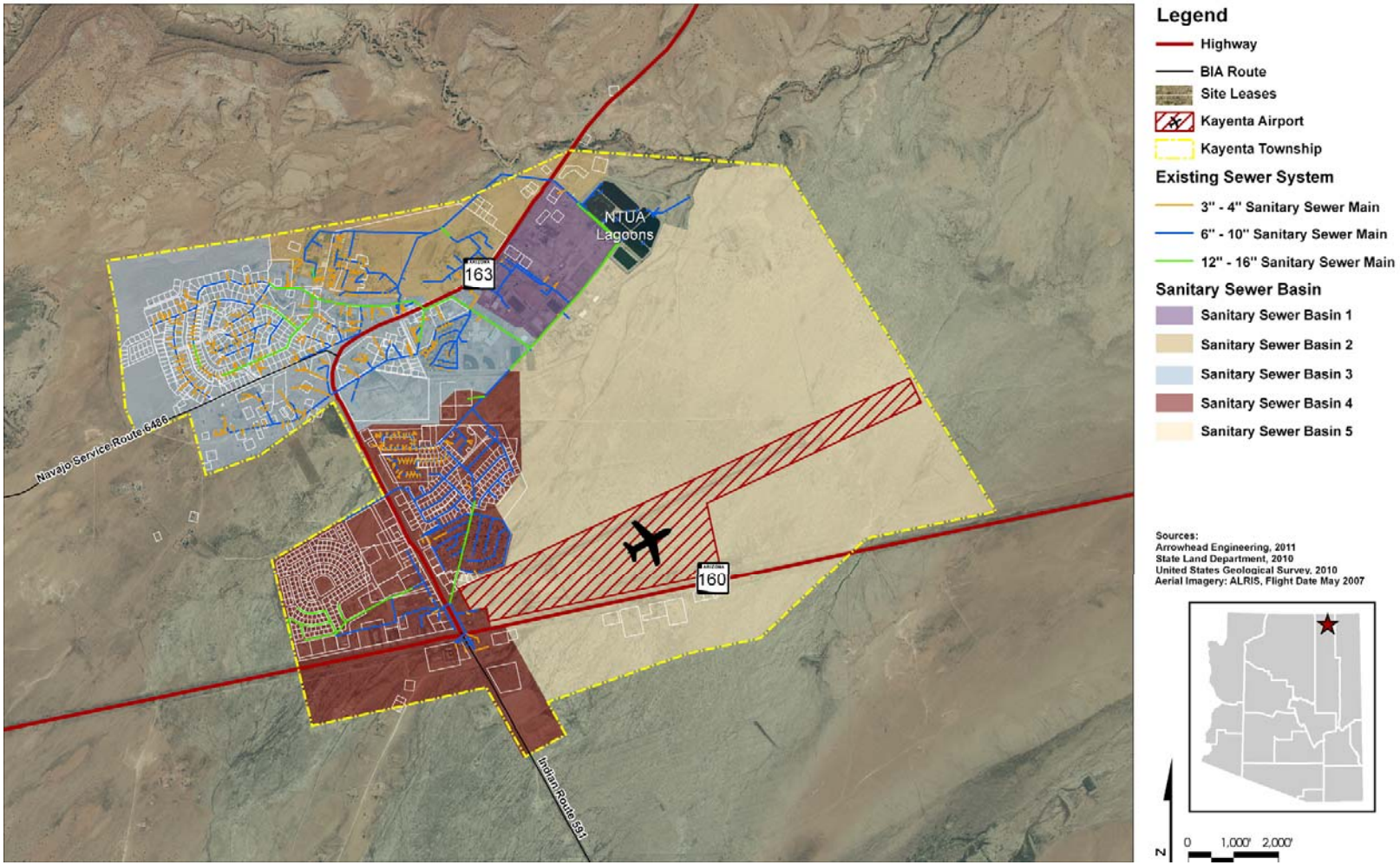
NTUA has jurisdiction of the sewer infrastructure in Kayenta. Coordination with NTUA will be required for all infrastructure improvements and additions. NTUA administers the design and permitting processes throughout the entire life of the project. NTUA has adopted regulations intended to protect the public health, safety and welfare, as well as to protect the environment. NTUA is also regulated by the Navajo Nation Environmental Protection, Water Quality Act of 1987 and the "EPA Policy for the Administration of Environmental Programs on Indian Reservation" (Nov 8, 1987). However, the review procedures and costs associated with compliance may serve to delay or preclude some activities and/or projects.

Existing Sewer System

Kayenta's sewer collection and treatment system are adequate for the current population. However, the system requires expansion in order to support the projected population. Changes in land use patterns and/or land use density/intensity will require utility upgrades. Exhibit 12 depicts the sewer basin.

AEI was not provided with analysis or evaluations necessary to determine deficiencies throughout the collection and treatment system currently in place. It is assumed that it is NTUA's responsibility to evaluate the sewer system to ensure that infrastructure deficiencies are adequately addressed and that infrastructure is in place prior to the approval and/or construction of future development. The type of comprehensive assessment of the community's wastewater treatment system provided in a Wastewater Master Plan would benefit Kayenta. This type of facility capacity master planning will assist in determining if existing sewer system facilities can accommodate the planned future developments.

EXHIBIT 12: Existing Wastewater System



Solid Waste Disposal System

The Kayenta Township Public Works Department operates the public facilities for the safe and sanitary disposal of solid waste generated within Kayenta under authority from the Navajo Nation. The Transfer Station is located northwest of the Kayenta Lagoon System. The Kayenta Township Public Work Department Transfer Station Enterprise offers trash pickup service, but the majority of the public haul their solid waste to the transfer station. Since Kayenta does not have a landfill, during the week, a truck has to deliver that week's trash to The White Mesa Landfill just past Bluff, Utah, which is about 89 mile one way.

Data, Cable and Telephone Service

Data, cable, and telephone services are provided by Frontier Communications. Consistent with the provision of electrical service, it is assumed that all of the existing overhead telephone and cable television facilities will be placed underground, and all new facilities will be placed underground in all new public and private streets.

Electrical

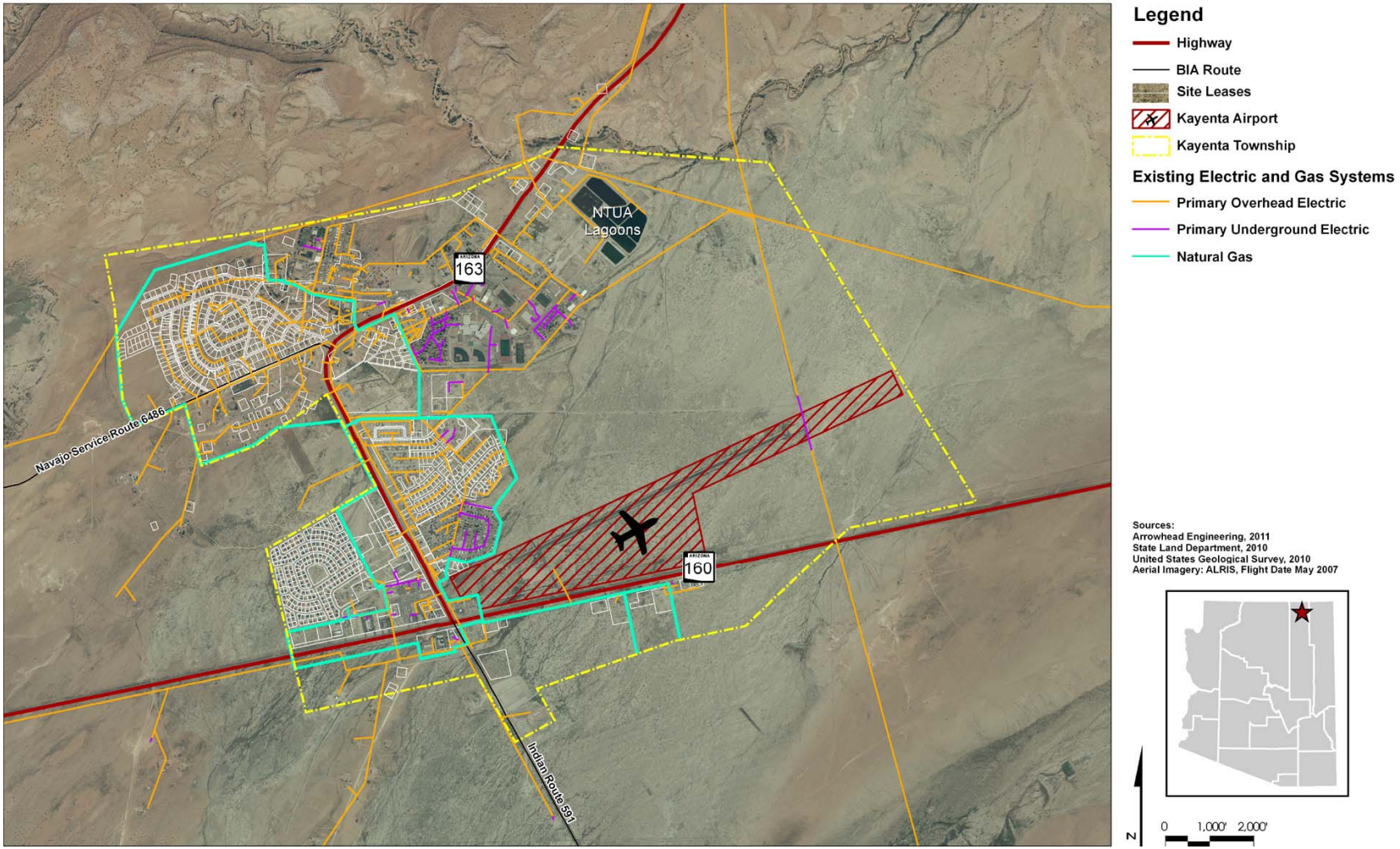
NTUA provides electrical services throughout the Navajo Nation. In addition to serving Kayenta, the Kayenta NTUA regional station service area includes the chapter areas of Chilchinbeto, Oljato, Dennehotso, Shonto, Inscription House, Black Mesa, Mexican Water, Tuba City, LaChee, Bodaway, and Rock Point. The office provided electricity to 3,155 customers in Kayenta in 1986. The number increased to 4,922 customers in 2,000 and it currently provides all the electrical needs for the Township. NTUA will continue to plan for growth and expansion.

The majority of the electric lines provide 14.4 and 24.9-kilovolt service, and nearly all the lines are located overhead. Future development within Kayenta would increase electric demand, since many of the existing land uses have low electric requirements. As development proceeds and as streets are constructed or reconfigured, upgraded service may be required. It is assumed that all new streets within specific planned areas will incorporate overhead and underground 14.4 and 24.9-kilovolt service. Exhibit 13 Shows existing electric and gas facilities.

Gas Service

NTUA provides gas service to the Kayenta Township. The source of their gas is delivered by Questar Southern Trails Pipeline from a 16" natural gas transporter. Exhibit 13 Shows existing electric and gas facilities. The 7 ½ miles of gas lines within Kayenta consist of high-pressure polyethylene lines. Future development within Kayenta is anticipated to increase demand for gas service, and existing and new streets within the plan area may require high-pressure plastic lines.

EXHIBIT 13: Existing Electrical and Gas Utility Systems



Recreation, Parks, Trails and Open Space

A well integrated system of parks, trails and natural open spaces is an essential component of a sustainable community. Such an integrated system provides opportunities for recreation, enjoyment, exercise and beautification essential for the health and well being of community members. Incorporating these throughout the community and providing connectivity among these areas establishes a strong community identity, contributes to the area character and instills a strong sense of place. It also preserves valuable natural resources, and improves air quality. A system of natural open spaces, parks, and trails that is regionally unique and that blends recreation and the natural and built environments assists a community in achieving its vision of becoming a sustainable community. Protecting the ecological infrastructure of the area is an essential step towards this goal.

Standards and Guidelines

The National Recreation and Park Association (NRPA) recognizes the importance of establishing and using park and recreation standards as:

1. A national expression of minimum acceptable facilities for the residents of urban and rural communities.
2. A guideline to determine land requirements for various kinds of park and recreation areas and facilities.
3. A basis for relating recreational needs to spatial analysis within a community-wide system of parks and open space areas.
4. One of the major structuring elements that can be used to guide and assist regional development.
5. A means to justify the need for parks and open space within the overall land-use pattern of a region or community.

The purpose of such guidelines is to present recreation, park, trail and open space standards that are applicable nationwide for planning, land acquisition, and development of active and passive recreation, park, trail and open space, primarily at the community level. These standards should be viewed as a guide. They address minimum, not maximum, goals to be achieved.

These standards are interpreted according to the particular situation to which they are applied and specific local needs must be addressed during the preparation of a Recreation, parks, Trails and Open Space Master Plan. The standard derived from early studies. Recommended park acreages are based on nationwide averages. The expression of acres of park land per unit of population or the standard of 10 acres per 1,000 of population came to be the commonly accepted standard used by most communities in the United States.

Other standards adopted include the "percent of area" approach, determined by user characteristics and participation projections, and area use based on the carrying capacity of the land. Changes in standards are a measure of the growing awareness and understanding of both participant and resource (land, water, etc.) limitations. Parks are for people. Park, recreation, and planning professionals must integrate the art and science of park management in order to balance such park and open space resource values as water supply, air quality, wildlife habitat, vegetative communities, overall sustainability, etc.

Hierarchy of Parks

The desired quality of life in a community includes recreational amenities, habitat restoration and integration, as well as preservation of open space, particularly along major washes and riparian corridors.

It balances the built and natural environments. It also includes access to and integrated trail system. Such trail system includes access to pedestrian, bicycle and equestrian users and provides connectivity to the different areas, or land uses, within the community, including residential areas, schools, parks and recreational facilities. It also provides access to all segments of the population to a variety of recreation programs.

A first step towards achieving such quality of life is the adoption of levels of service standards for the provision of recreation, parks, trails, and open space. These standards can be used as general guidelines until a Recreation, Parks, Trails and Open Space Master Plan is prepared and adopted by the community. The policy direction in the form of action steps required to procure such open space is included in the community comprehensive or Comprehensive Plan. Such framework guides the preparation of future documents and the incorporation of implementation tools for recreation, parks, trails and open space. The following section and the table provided in the following page include recommended national guidelines for parks and recreational facilities.

The National Recreation and Parks Association developed a park classification system that includes guidelines for the establishment of a hierarchy of parks. These guidelines serve as a foundation from which communities can adopt level of service standards for parks, trails, and open space. A hierarchy of parks based on these national guidelines is provided in the following section.

Typical Pocket Park Design by The Planning Center

Pocket Park

A pocket park is the smallest park in the park classification system and should be considered as an alternative when providing a typical neighborhood park is impractical. Pocket parks provide open space and meet the recreational needs in high density urban neighborhoods. The site should be residential in scale and character and provide a quiet setting for park use. It should have a strong emphasis on passive uses such as picnic and sitting areas, include shade, and provide visibility from all adjoining streets to provide an inviting and safe environment. Table 1 lists standards for pocket parks.

Typical Pocket Park Design by The Planning Center

Neighborhood Park

A neighborhood park is the basic unit of the park system and serves as the recreational focus of an individual neighborhood. Surrounding uses should be predominantly single family or multi-family residential. Playgrounds, trails and usable open spaces are generally given the highest priority.

Park development should achieve a balance between active use areas such as sport fields and game courts and passive use areas intended for sitting, picnicking and relaxing. About half of the park area should incorporate passive activities and natural features. Uses requiring chain link fencing should be minimized in order to make the park visually attractive.

Typical Neighborhood Parks Designed by The Planning Center

Neighborhood parks are not intended for programmed activities that attract users from outside the neighborhood. Noise, glare, parking problems and street congestion should be minimized to provide a secured environment.

Typical Neighborhood Parks Designed by The Planning Center

Community Park

Community parks are typically larger in size than neighborhood parks and serve several neighborhoods with both active and passive recreational facilities. Group activities are well integrated and may include highly used recreational facilities such as programmed athletic sports fields, swimming pools and recreation centers, which are less appropriate for neighborhood parks due to the noise and vehicular traffic they generate.

Community parks may also contain large passive open space areas or preserve unique landscapes. About 25-50% should be undeveloped green or open space. This type of park, due to their location on major thoroughfares, provides a visual break in built environment.

Most of the park should be visible from adjoining streets. When located abutting a linear park, it provides opportunities to connect with adjacent neighborhoods, art districts or schools via hiking, nature or biking trails along the linear park.

Example of Community Park

Regional Park

Regional parks supplement community and neighborhood parks, serving broader based recreation needs in addition to those addressed in smaller parks. The increased size permits larger development of both active and passive facilities, providing a wide range of recreational pursuits.

Regional parks should include sizeable areas of undeveloped land with natural vegetation and/or water features. When possible, major thoroughfares should be routed around regional parks rather than through them. Regional parks can also incorporate linear parks and provide connectivity to the regional trail system.

Typical Regional Park Designed by The Planning Center

Linear Park

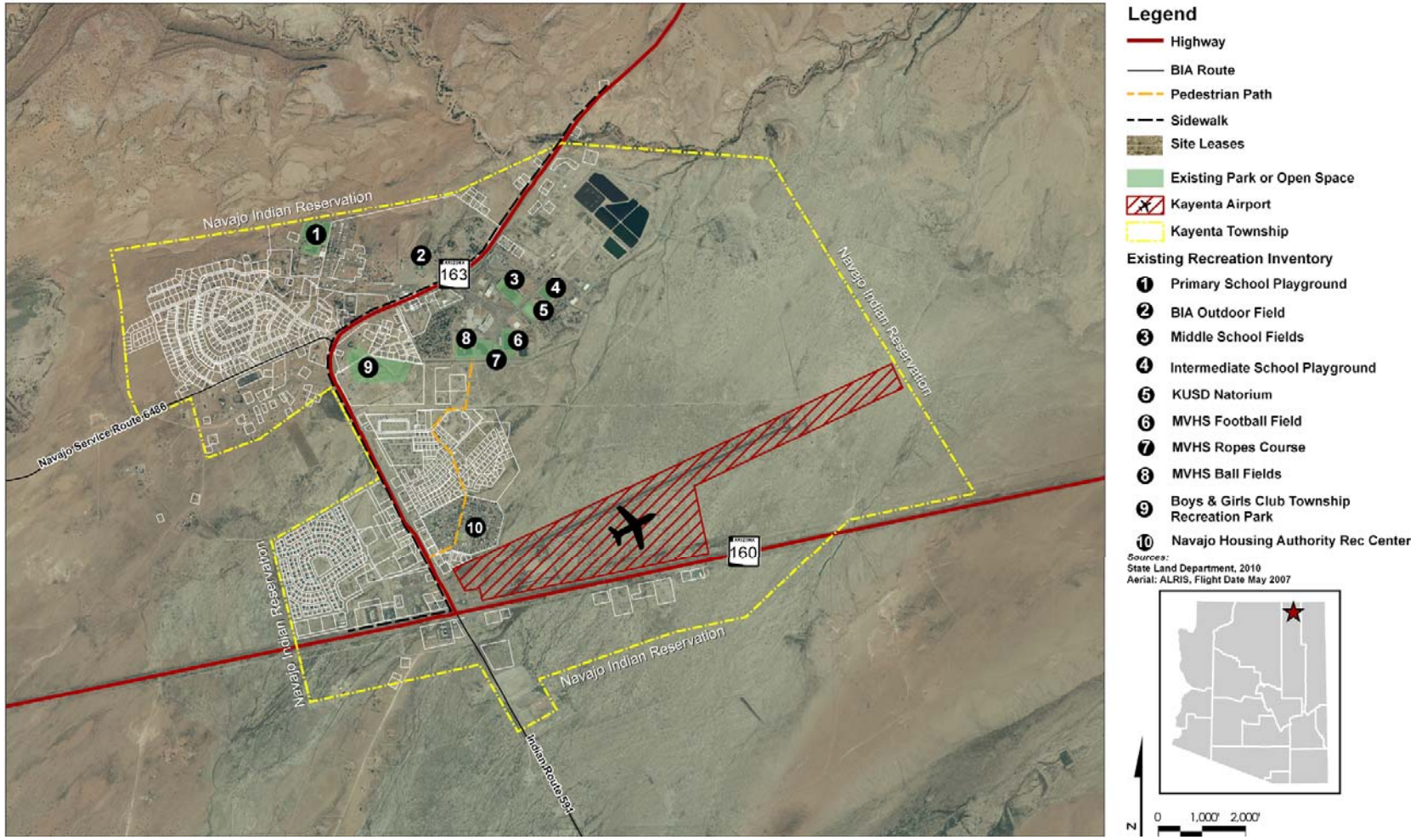
Linear parks are greenways of open space that offer scenic beauty and allow safe, uninterrupted pedestrian, bicycle or equestrian movement along natural or built corridors. They are generally located along rivers, streams or in association with major thoroughfares or boulevards. This type of park is ideal along major washes or riparian habitats or wildlife corridors. They can also serve to buffer residential areas from higher intensity uses such as the Kayenta airport. When linked to trails, walkway and bikeway systems, linear parks can provide connectivity to other parks, residential neighborhoods, schools, libraries and businesses.

Linear parks provide breaks in the urban development pattern, conserve ecologically unique areas along river corridors, incorporate habitat restoration, and provide long stretches of open space well suited for multi-use trail systems.

Exhibit 14 shows parkas, recreation, trails and open space facilities within Kayenta Township.

Interpretive Node on Natural Trail System Designed by The Planning Center

EXHIBIT 14: Kayenta Township Existing Parks, Recreation, Trails and Open Space.

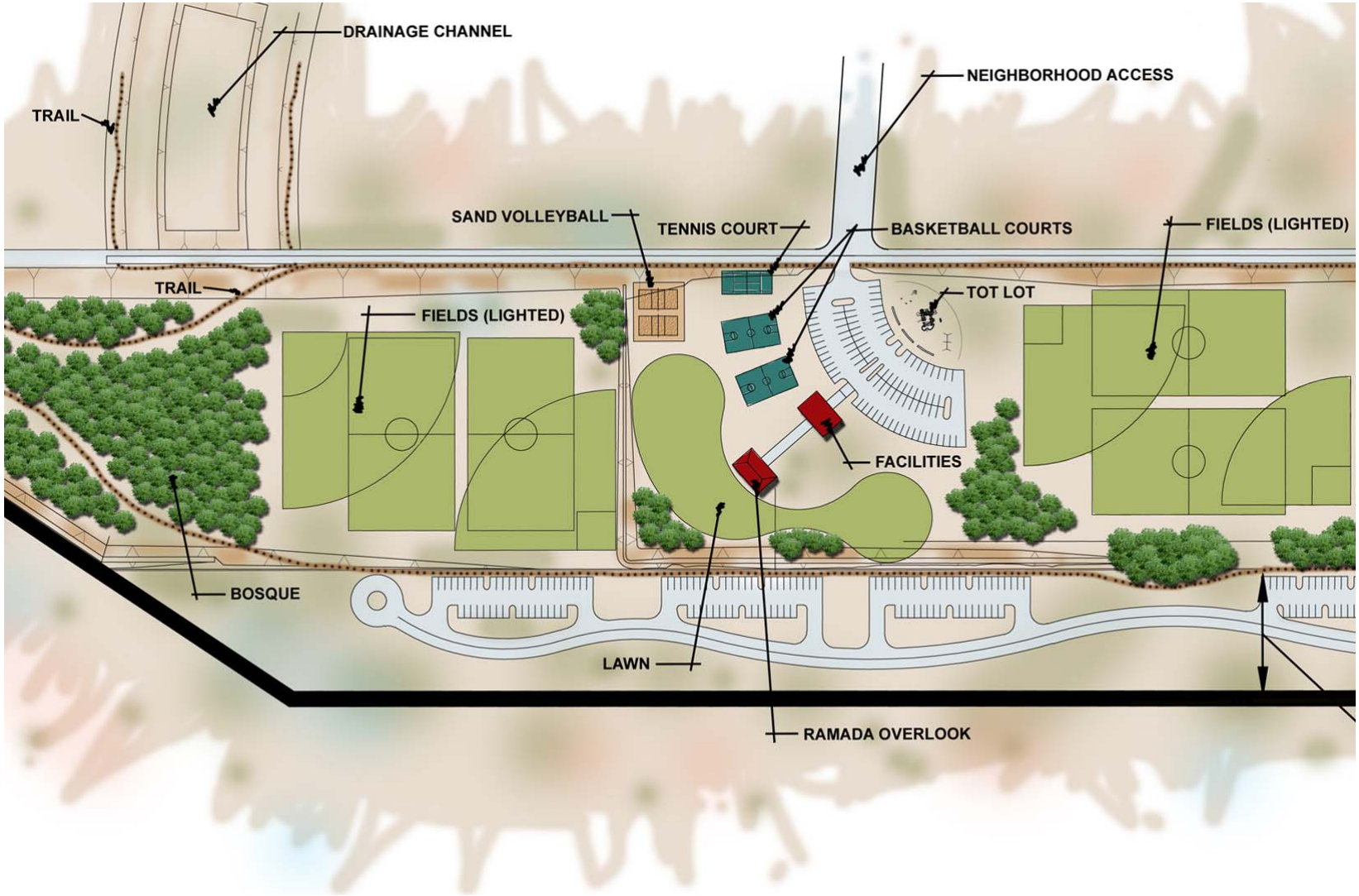


Example of Passive Recreation: Community Garden, Pima Canyon, Pima County, Arizona, The Planning Center

Standards for Active and Passive Recreation

Table 12 includes widely accepted standards for active and passive recreation. Active recreation includes fields, courts, swimming pools, trails, fishing areas, and facilities that promote recreation activities. Passive recreation includes ramadas, gardens, picnic areas and facilities that allow its users to gather, relax and contemplate nature without needing to engage in a specific sports or activity.

Example of Active Recreation: Multi-Use Path, Including Opportunities for Jogging, Hiking and Bicycle Riding, The Planning Center



Example of Active Recreation: Sand Volleyball, Basketball, Tennis Courts, Fields, The Planning Center

Table 12
Recreation, Parks, Trails and Open Space Standards

ACTIVITY/ FACILITY	RECOMMENDED SPACE REQUIREMENTS	RECOMMENDED SIZE AND DIMENSIONS	RECOMMENDED ORIENTATION	NO. OF UNITS PER POPULATION	SERVICE RADIUS	LOCATION NOTES
Badminton	1620 sq. ft.	Singles – 17'x44' Doubles – 20'x44'	Long axis north-south	1 per 5000	¼ -1/2 mile	Usually in school, recreation center or church facility. Safe walking or bike access.
Basketball **1. Youth** **2. High School** 3. **Collegiate**	2400-3036 sq. ft. 5040-7280 sq. ft. 5600-7980 sq. ft.	46-50'x84' 50'x84' 50'x94' with 5' unobstructed space on all sides	Long axis north-south	1 per 5000	¼ - ½ mile	Same as badminton. Outdoor courts in neighborhood and community parks, plus active recreation areas in other park settings.
Handball (3-4 wall)	800 sq. ft. for 4-wall 1000 for 3-wall	20'x40' – Minimum of 10' to rear of 3-wall court. Minimum 20' overhead clearance	Long axis north-south. Front wall at north end.	1 per 20,000	15-30 minute travel time	4-wall usually indoor as part of multi-purpose facility. 3-wall usually outdoor in park or school setting
Tennis	Minimum of 7,200 sq. ft. single court (2 acres for complex)	36'x78'. 12' clearance on both sides; 21' clearance on both ends.	Long axis north – south	1 court per 2000	¼-1/2 mile	Best in batteries of 2-4. Located in neighborhood/community park or adjacent to school
Volleyball	Minimum of 4,000 sq. ft.	30'X60'. Minimum 6' clearance on all sides	Long axis north-south	1 per 5000	¼ - ½ mile	Same as other court activities (e.g. badminton)

Source: Lancaster, R.A. (Ed.). (1990), Recreation, Parks and Open Space Standards and Guidelines, Ashburn, VA. National Recreation and Parks Association.

Table 12
Recreation, Parks, Trails and Open Space Standards
(Continued)

ACTIVITY/ FACILITY	RECOMMENDED SPACE REQUIREMENTS	RECOMMENDED SIZE AND DIMENSIONS	RECOMMENDED ORIENTATION	NO. OF UNITS PER POPULATION	SERVICE RADIUS	LOCATION NOTES
Baseball **1. Official** 2. **Little League**	3.0-3.85 A minimum 1.2 A minimum	Baselines – 90' Pitching distance 60 ½' foul lines – min. 320' Center field – 400'+ Baselines – 60' Pitching distance – 46' Foul lines – 200' Center field – 200' – 250'	Locate home plate to pitcher throwing across sun and batter not facing it. Line from home plate through pitchers mound run east-north-east.	1 per 5000 Lighted 1 per 30,000	¼ - ½ mile	Part of neighborhood complex. Lighted fields part of community complex.
Field Hockey	Minimum 1.5 A	180' x 300' with a minimum of 6' clearance on all sides.	Fall season – long axis northwest to southwest. For longer periods north-south	1 per 20,000	15-30 minutes travel time	Usually part of baseball, football, soccer complex in community park or adjacent to high school.
Football	Minimum 1.5 A	160' x 360' with a minimum of 6' clearance on all sides.	Same as field hockey.	1 per 20,000	15-30 minutes travel time	Same as field hockey.

Source: Lancaster, R.A. (Ed.). (1990), Recreation, Parks and Open Space Standards and Guidelines, Ashburn, VA. National Recreation and Parks Association.

Table 12
Recreation, Parks, Trails and Open Space Standards
(Continued)

ACTIVITY/ FACILITY	RECOMMENDED SPACE REQUIREMENTS	RECOMMENDED SIZE AND DIMENSIONS	RECOMMENDED ORIENTATION	NO. OF UNITS PER POPULATION	SERVICE RADIUS	LOCATION NOTES
Soccer	1.7 – 2.1 A	195' to 225'x330' to 360' with a minimum 10' clearance all sides.	Same as field hockey.	1 per 10,000	1-2 miles	Number of units depends on popularity. Youth soccer on smaller fields adjacent to schools or neighborhood parks.
Golf-driving Range	13.5 A for minimum of 25 tees	900'x690' wide. Add 12' width for each additional tee.	Long axis south-west-northeast with golfer driving toward northeast.	1 per 50,000	30 minutes travel time.	Part of a golf course complex. As separate unit may be privately owned.
¼ Mile Running Track	4.3 A	Overall width – 276' Length – 600.02' Track width for 8 to 4 lanes is 32'.	Long axis in sector from north to south to north-west-south-east with finish line at northerly end.	1 per 20,000	15-30 minutes travel time	Usually part of high school, or in community park complex in combination with football, soccer, etc.

Source: Lancaster, R.A. (Ed.). (1990), Recreation, Parks and Open Space Standards and Guidelines, Ashburn, VA. National Recreation and Parks Association.

Table 12
Recreation, Parks, Trails and Open Space Standards
(Continued)

ACTIVITY/ FACILITY	RECOMMENDED SPACE REQUIREMENTS	RECOMMENDED SIZE AND DIMENSIONS	RECOMMENDED ORIENTATION	NO. OF UNITS PER POPULATION	SERVICE RADIUS	LOCATION NOTES
Softball	1.5 to 2.0 A	Baselines – 60 ‘ Pitching distance- 46’ min. 40’ women. Fast pitch field Radius from Plate – 225’ Between foul Lines. Slow Pitch – 275’ (men) 250’(women)	Same as baseball	1 per 5,000 (if also used for youth baseball)	¼ - ½ mile	Slight differences in dimensions for 16" slow pitch. May also be used for youth baseball.
Multiple Recreation Court (basketball, volleyball, tennis)	9, 840 sq. ft.	120’ x 80’	Long axis of courts with *primary* use is north-south	1 per 10,000	1-2 miles.	
Trails	N/A	Well defined head maximum 10’ width, maximum average grade is 5% not to exceed 15%. Capacity rural trails – 40 hikers/day/mile. Urban trails – 90 hikers/day/mile.	N/A	1 system per region	N/A	

Source: Lancaster, R.A. (Ed.). (1990), Recreation, Parks and Open Space Standards and Guidelines, Ashburn, VA. National Recreation and Parks Association.

Table 12
Recreation, Parks, Trails and Open Space Standards
(Continued)

ACTIVITY/ FACILITY	RECOMMENDED SPACE REQUIREMENTS	RECOMMENDED SIZE AND DIMENSIONS	RECOMMENDED ORIENTATION	NO. OF UNITS PER POPULATION	SERVICE RADIUS	LOCATION NOTES
Archery Range	Minimum 0.65 A	300' Length x Minimum 10' wide between targets. Roped clear space on sides of range minimum 30', clear space behind targets minimum of 90'x45' with bunker.	Archer facing north = or – 45 degrees.	1 per 50,000	30 minutes travel time	Part of regional or metro park complex.
Golf **1. Par 3 (18 hole)** **2. 9-hole standard** 3. **18-hole standard**	50-60 A Minimum 50 A Minimum 110 A	Average length vary 600-2700 yd. Average length –2250 yards Average length 6500 yards	Majority of holes on north-south axis	-- 1/25,000 1/50,000	½ to 1 hour travel time	9 hole course can accommodate 350 people/day. 18 hole course can accommodate 500-550 people/day. Course may be located in community or district park, but should not be over 20 miles from population center.

Source: Lancaster, R.A. (Ed.). (1990), Recreation, Parks and Open Space Standards and Guidelines, Ashburn, VA. National Recreation and Parks Association.

Table 12
Recreation, Parks, Trails and Open Space Standards
(Continued)

ACTIVITY/ FACILITY	RECOMMENDED SPACE REQUIREMENTS	RECOMMENDED SIZE AND DIMENSIONS	RECOMMENDED ORIENTATION	NO. OF UNITS PER POPULATION	SERVICE RADIUS	LOCATION NOTES
Swimming Pools	Varies on size of pool and amenities. Usually ½ to 2 A site.	*Teaching*- minimum of 25 yards x 45' even depth of 3 to 4 ft. *Competitive* – minimum of 25 m x 16 m. Minimum of 27 square feet of water surface per swimmer. Ratios of 2:1 deck vs. water.	None-although care must be taken in siting of lifeguard stations in relation to afternoon sun.	1 per 20,000 (Pools should accommodate 3 to 5% of total population at a time.)	15 to 30 minutes travel time	Pools for general community use should be planned for teaching, competitive and recreational purposes with enough depth (3.4m) to accommodate 1m and 3m diving boards. Located in community park or school site.

Source: Lancaster, R.A. (Ed.). (1990), Recreation, Parks and Open Space Standards and Guidelines, Ashburn, VA. National Recreation and Parks Association.

Transportation and Circulation

All the land, water, and air routes make up the transportation and circulation system of a community. Such system allows the movement of people and goods and is a key factor in the economic success of a region. A safe, efficient and convenient multimodal transportation system providing access and connectivity to a variety of transportation modes is a vital component to Kayenta's viability, livability, sustainability and long-range economic success.

The primary and often only means of transportation across the Navajo Nation is cars and trucks. These are the primary forms of mobility for families living in the different growth centers. The Navajo Nation Growth Centers are small satellite urban communities designated for development and economic activity.

Although internally, these growth centers offer better accessibility to markets, services and highways, most people still walk or drive to their destinations.

The close proximity between these growth centers and their satellite communities creates commuter, home-to-work traffic and other trips between these communities. Development along the connecting corridor cannot be planned in isolation and require regional planning. Such comprehensive regional transportation efforts, addressing corridor connections between these growth centers and their satellites must also integrate street, pedestrian and bicycle circulation systems between these communities as well as the inter-modal connection needs at each community.

Currently, convenient, safe and efficient walkways defining the public realm, creating a sense of place and providing shortcuts and connectivity to goods, services, amenities, recreation, parks, trails and open space, do not exist for community members or visitors to shop, visit, or exercise. Bicycle routes are none existent. This high dependency on automobiles, makes these growth centers highly dependant on fossil fuels. As a result, both community health and the environmental wellbeing are adversely impacted.

In Kayenta, approximately ninety-seven (97) percent of the population uses the typical means of travel. These are automobiles, pick-up trucks, motorcycles and some bicycles. The Navajo Nation Transit System (NNTS) provides transit services throughout the Navajo Reservation. NNTS provides transit services between Kayenta and Window Rock. The transit bus system departs Kayenta at 6:00 AM and arrives in Window Rock at 10:00 AM. The return trip departs Window Rock at 2:00 PM and arrives in Kayenta at 6:00 PM.

Multimodal Long Range Transportation

Concurrent to the preparation of this Comprehensive Plan, The Arizona Department of Transportation (ADOT) is seeking proposals to prepare and ADOT Planning Assistance for Rural Areas (PARA) study. This PARA study titled Chinle-Many Farms and St. Michaels-Windo Rock-Ft. Defiance Multimodal Long Range Transportation Study will be prepared for the Navajo Nation Division of Transportation (NNDT). This PARA study will address the needs of multiple jurisdictions as well as the needs of neighborhoods within such jurisdictions. The major product of this study will be two final multimodal transportation plans for: (1) Chinle-Many Farms; and (2) St. Michaels-Window Rock-Ft. Defiance.

Each plan will contain a refined plan for improvements over five, ten, and twenty year periods, incorporating both roadway system and the multimodal needs of the area. While each community possesses the potential to grow independently into larger townships, this study will consider Chinle-Many Farms as one study and St. Michaels –Window Rock-Ft. Defiance as another study.

The principal focus of the proposed study is to address the most critical transportation planning needs identified by the Navajo Nation Division of Transportation (NNDT). Development growth centers within the Nation lack the updated transportation plans to guide their development into larger urbanized centers. There are few planned and developed streets, sidewalks and walkways around schools and housing tracts. As a result, comprehensive planning is needed for strategic, controlled development and access management.

Although each community is growing and now supports economic development, employment, schools, housing and health care, they are confined to only one or two main thoroughfares (state and or BIA roads) to meet their transportation needs. With the majority of vehicular traffic confined to the main thoroughfares, traffic congestion is a problem when community members attempt to be at the same place at the same time. As a consequence, safety is compromised. This situation is exacerbated when there is competition for the same space with large diesel trucks and interstate travelers. As such, motor vehicle, pedestrian and biker safety and accessibility are compromised. These in turn pose very apparent transportation issues for the growth centers within these studies.

Effective measures for planned development have to be implemented or problems will only increase with the Navajo Nation population and proportionate needs in transportation facilities and infrastructure to meet the demand. A multimodal transportation plan for each growth center will include the following objectives:

- Develop transportation plans for rural communities of the Navajo Nation in order to promote travel safety, mobility, enhance economic vitality and improve community livability and increase community sustainability.
- Support current and long-range planning for economic and community development.
- Address transportation needs for each Navajo community in regards to multi-modal transportation needs for vehicular, pedestrian and bicycle transportation that promotes safety for community residents, commuters and visitors while enhancing the quality of life.
- Address inter-modal connections between vehicular, airport and transit systems for commuter and emergency needs.
- Recommend transportation improvements of the State and BIA and other road systems within and between these communities, including impacts to Navajo Nation's transportation network and other regional transportation systems.
- Recommend improvements of multi-modal and inter-modal transportation to address such needs within and between the communities including impacts to the Navajo Nation's total transportation network and the regional transportation system.

An extensive public participation program is included as part of this study that will allow the NNDT to actively seek input from neighbors, business owners and major stakeholders and incorporated their priorities into the plan and their program for improvements. Extensive community outreach will result in stronger community support for funding transportation improvements. A technical Advisory Committee (TAC) has been established to closely coordinate this study. The following agencies are represented on this Committee:

- Navajo Division of Transportation
- ADOT Holbrook District Engineer
- Many Farms Chapter Representative
- St. Michaels Chapter Representative
- Fort Defiance Chapter Representative
- ADOT Multimodal Planning Division
- Navajo Region Bureau of Indian Affairs
- BIA Roads Agency Engineers, Ft. Defiance and Chinle
- ADOT Environmental Planning Group
- Arizona State Land Department
- Apache County
- ADOT Communication & Community Partnership

It is anticipated that the study will be completed concurrent to the preparation of this document. Therefore, the Kayenta Comprehensive Plan Transportation Element will reflect the findings of the study.

Navajo Nation/Navajo DOT/ADOT/FHWA/Navajo County Partnership

The Navajo Nation is largely based in Arizona. The Nation also extends into Utah and New Mexico. The reservation is 27,000 square miles and is larger than 10 of the 50 states in the United States. Navajo land has a vast diversity in terrain ranging from the high desert to mountainous regions. It is well known for the majestic Red Rocks that are a breathtaking view in the Arizona sunset.

There are six scenic routes on Navajo land. One is Navajo Mountain Road that traverses 58 miles along SR98 from Page, Arizona to the intersection of US160. This route is a great way to enter the Nation for first time visitors. Second is the Kayenta-Monument Valley Scenic Byway located on US163 and is known as the "Gateway to Monument Valley." It begins in Kayenta, AZ and ends at the Utah border. Third is the Flat Mesa Rock Scenic Road that is located on US191 between milepost 467 and 510. The road weaves through northeastern Arizona. Fourth is the Fredonia-Vermilion Cliffs Scenic Road that traverses 82 miles along SR89A between mileposts 525 and 607. This is known as the gateway to the Colorado River in Marble Canyon and to the North Rim of the Grand Canyon. The fifth scenic route is Among the People Scenic Road that weaves through the high desert, mountains, valley, canyon country and lakes. It is 105 miles long from I-40 near the Arizona and New Mexico Border and north towards Canyon De Chelly National Monument on Navajo Routes 12 and 64. The last one is a road network that encompasses a web roadway in Utah and New Mexico (Navajo Scenic Roads).

2009 Navajo Nation Long-Range Transportation Plan

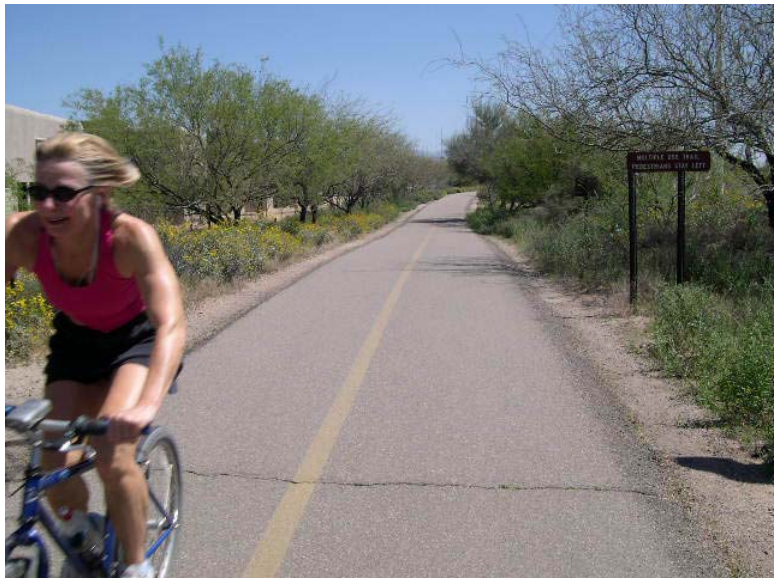
The 2009 Navajo Nation Long Range Transportation Plan (LRTP) is a twenty-year comprehensive plan developed and updated by the Navajo Division of Transportation (Navajo DOT) in a five-year cycle. The 2009 LRTP identifies the Nation's multi-modal transportation needs over the next 20 years and develops strategies to meet them. The plan provides long range planning policies and implementation strategies for the Navajo Indian Reservation Roads (IRR) Program improvements. It is based on a comprehensive analysis of all pertinent factors and issues affecting the Navajo Nation's existing and future transportation needs.

The 2009 LRTP followed a planning process which included examination of tribal and IRR program policies and transportation issues; socioeconomic data and development plans; all modes of transportation data (roads, bridges, airports, transit and rails (including road inventory data for future traffic volume and transportation improvement needs according to highway design guidelines and pavement management requirements); and crash data analysis for safety needs. The review process included public involvement at public hearings and final approval by the tribal transportation committees. Figure 2 illustrates the long-range transportation plan planning process.

The LRTP is an important component in obtaining Federal funding for roadway improvements through the IRR Program. The Navajo IRR Program is administered jointly by the Bureau of Indian Affairs Division of Transportation and the Federal Lands Highways Program (FLHP) of the Federal Highway Administration.
The BIA Navajo Regional Office – Division of Transportation (BIA-NRODOT) administers Navajo Region of the IRR Program construction and maintenance. To qualify for the funding, each Indian Reservation must establish an approved long range transportation plan and Tribal Transportation Improvement Program (TTIP) which is a 3- to 5-year road and bridge construction priority schedule. The Navajo Nation will use this 2009 LRTP to satisfy the long range transportation plan requirement, and will utilize the findings and recommendations of the LRTP to define a 3-5 year road and bridge construction of the Navajo Nation Transportation Improvement Program (TIP).

The purpose of this plan, as required by federal agency regulations, is to identify transportation improvement needs for funding Navajo Nation long range transportation improvements. This LRTP is also intended to be a transportation planning tool for the Transportation and Community Development Committee (TCDC) of the Navajo Nation Council and the Agency Roads Committees (ARC). It further provides recommendations for long range improvements for Navajo-BIA, State, and County roads, bridge, airport as well as transit improvements. The recommendations of the LRTP will provide guidance to the Navajo Nation, Navajo DOT, the State Departments of Transportation, Chapter communities within the Reservation, and private interests when considering future development plans.

The Navajo Nation LRTP is the Navajo Nation's vision of future transportation construction to fulfill and meet the Nation's long term transportation needs. The planning process and methodology used in this plan includes examination of tribal and IRR program goals and objectives, highway design criteria, and transportation issues to identify future needs.



Transportation Goals

The goals of the LRTP are to:

1. Provide a comprehensive transportation system that encompasses all modes of transportation, including rail, bus, and air.
2. Provide safe and efficient transportation network to and within the Navajo Reservation.
3. Improve overall road and bridge conditions to achieve a reduction in the number and severity of traffic accidents.
4. Develop the necessary multimodal transportation system to foster and support economic development and increase employment opportunities.
5. Provide a high level of connectivity between Growth Centers including Shiprock, Tuba City, Chinle, Fort Defiance, Window Rock, Crownpoint, and Kayenta.

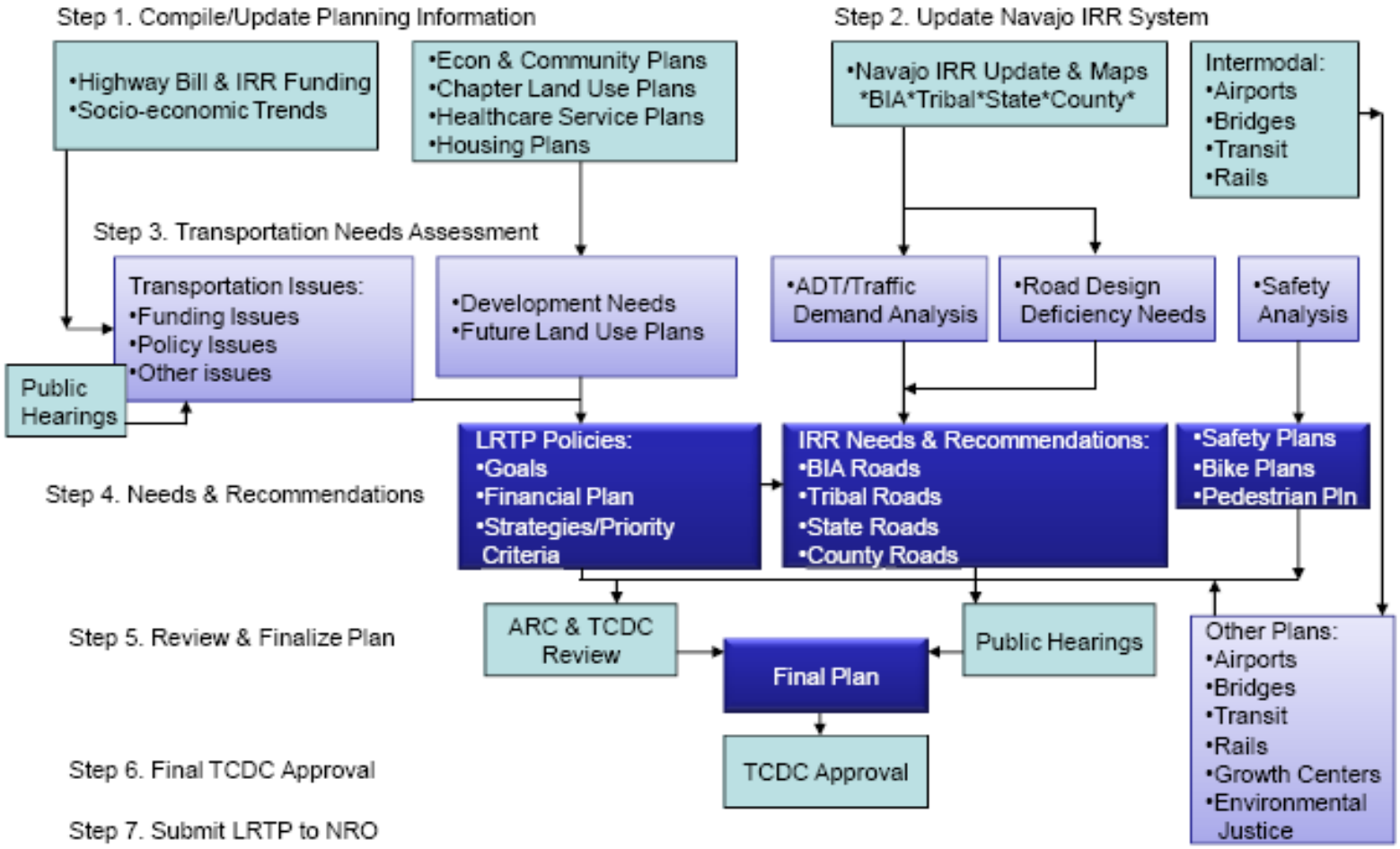
Federal Funding of Indian Reservation Road System

The IRR program was established to provide for construction of public roads and bridges under Bureau of Indian Affairs (BIA) administration. Its funding is authorized under the Federal Lands Highway Program (FLHP) and through the Bureau of Indian Affairs-Division of Transportation. The 1948 and subsequent memorandum of agreements between the BIA and Federal Highway Administration (FHWA) established their joint responsibilities for the IRR program.

The purpose of the IRR program is to provide safe and adequate transportation facilities including public road access to and within Indian reservations, Indian trust land, or Native American communities. Indian Reservation Roads by definition include BIA, state, county, and other local government public roads.

In 1998, a funding distribution formula was developed for the IRR Program under the Transportation Equity Act for the 21st Century (TEA-21). Originally, tribal allocations were distributed according to the Relative Needs Distribution Formula (RNDF). In July 2004, a new distribution formula and updated IRR regulations, referred to as the Tribal Transportation Allocation Methodology (TTAM), as documented in the IRR Program final regulation, 25 CFR Part 170. The TTAM uses an inventory of IRR facilities as the major factor in determining the funding amounts that each Tribe receives. The updated regulation removed growth limitations in the inventory and initiated significant incentives for Tribes to add all eligible tribal, State, and county routes to the inventory with somewhat negative impacts to the larger land based tribes. Using the TTAM allocation formula, the IRR funds are distributed to twelve (12) BIA regional offices.

Figure 2:
Long-range Transportation Plan Planning Process



Source: 2009 Navajo Nation Long-Range Transportation Plan.

The IRR Program funds can be used for any type of Title 23 transportation project providing access to or located within Federal or Indian reservations, Indian trust land, restricted Indian land, and Alaska native villages, and may be used for the State Local matching share for apportioned Federal-aid Highway Funds. Title 23, United State Code provides statutory requirements for IRR and other federal funded highway programs. Congress has been appropriating funds for IRR through highway appropriations. The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) authorized IRR funding for FY2005-2009.

As a condition for the continuance of IRR funds and in accordance with 23 USC 116, the BIA Regional Offices and Tribes are responsible for road maintenance of BIA and tribal roads respectively using Department of the Interior (DOI) funds appropriated annually under DOI Appropriation Acts, tribal funds, and up to 25% of IRR construction funds authorized under SAFETEA_LU.

The current SAFETEA-LU highway authorization contains a statute that directs the Secretary of Transportation, in cooperation with the Secretary of the Interior, to complete a comprehensive national inventory review of transportation facilities eligible under the IRR Program. Each year, the inventory may be updated by tribes to reflect the transportation needs, which are ranked against the relative needs of other tribes.

Navajo Nation Indian Reservation Road System (IRR)

An IRR System is defined as a road network serving an Indian reservation, comprised of public road systems located within, or providing access to it. Navajo IRR roads are funded and administered by various government highway programs. According to the 2008 Navajo Region Road Inventory (NRRI) database, the Navajo IRR system consists overall of 12,631.5 miles of public roads that can be subdivided by right-of-way ownership or program administration as follows: Navajo-BIA roads (6,147.9 miles); tribal roads (2,895.7 miles); state roads (1,595.5 miles); county roads (1,907.5 miles); other BIA programs' roads (46.9 miles); other federal agency roads (37.2 miles), and others roads (0.8 miles). Navajo-BIA, state and county roads are the main road systems serving the Navajo Reservation.

Navajo Nation Bureau of Indian Affairs Roads

Navajo Nation BIA Road System consists of existing and proposed public roads within the Navajo Reservation that meet the IRR definition and for which the BIA Navajo Regional Office Division of Transportation (BIA-NRODOT) has or plans to obtain a legal right-of-way.

The Navajo-BIA road system or Navajo Routes include arterial roads, streets and other local public roads either linking to the state highway network or providing access to local Navajo communities. The Navajo-BIA road system, totaling 6,147.9 miles, is the largest component of the Navajo IRR systems. The Navajo-BIA road system is subdivided into seven agencies for administrative and inventory purposes: Shiprock/Northern, Western, Eastern, Chinle, Ft. Defiance, NIIP, and New Lands Agencies.

Existing Roadways Functional Classification

This section provides a description of the various roadway classifications, or hierarchy of roads, as defined in the DOI-BIA IRR Coding Guide, October 2004.

Class 1 - Major Arterial Roads

The Navajo-BIA Class 1 roads are major arterial roads providing an integrated network with characteristics for serving traffic between large population centers, generally without stub connections and having average daily traffic volumes of 10,000 vehicles per day or more with more that two lanes of traffic. Class 1 roads constitute 4.1 miles or only 0.07% of the total Navajo-BIA system.

Class 2 - Rural Minor Arterial Roads

The Navajo-BIA Class 2 roads are rural minor arterial roads providing an integrated network having characteristics for serving traffic between large population centers, generally without stub connections. These roads typically link smaller towns and communities to major resort areas that attract travel over long distances and generally provide for relatively high overall travel speeds with minimum interference to through traffic movement. Class 2 roads generally provide for at least inter-county or interstate service and are spaced at intervals consistent with population density. This class of road will have less than 10,000 vehicles per day. Class 2 roads constitute 816.0 miles or 13% of the entire Navajo-BIA system.

Class 3 - Streets

Street type roads are located within communities serving residential and other urban areas. These are streets at Navajo Growth Center communities, Navajo Housing Authority housing streets, etc. Class 3 streets amount to 58.1 miles or 1.0% of the total Navajo-BIA system.

Class 4 - Rural Collector Roads

The Navajo-BIA Class 4 roads are rural major collector roads that serve as a collector to rural local roads. The Navajo-BIA Class 4 roads make up most of the Navajo-BIA system, 3,827.4 miles or 62%.

Class 5 - Rural Local Roads

These roads are rural local roads that may be either section line or stub type roads, which make connections within the grid of the IRR system. This class of road may serve areas around villages, into farming areas, to schools, tourist attractions, or various small enterprises. This class also includes roads and motorized trails for administration of forests, grazing, mining, oil, recreation, or other use purposes. Class 5 roads amount to 1,438.8 miles of the total Navajo-BIA system, or 24%.

Class 6 - City Minor Arterial Roads

These roads consist of minor arterial streets that are located within communities and serve as access to major arterials. Class 6 roads amount to 3.5 mile or only 0.06% of the total Navajo-BIA system.

Class 7 - City Collector Streets

These are streets located within communities and serve as collectors to the city local streets. The Navajo Nation currently has none of this road class.

Classes 8-10

These are classification for non-road and other intermodal transportation facilities. The Navajo Nation has yet to inventory these.

Class 11

This is a classification to indicate an overlapping or previously inventoried road section (s) and is used to indicate that it is not to be used for accumulating needs data. This class is used for reporting and identification only.

Navajo-BIA Roads by Surface Type

The majority of Navajo-BIA roads are unpaved. Out of 6,147.9 miles total Navajo-BIA roads, only 1,494.4 miles (24%) are paved, 105.7 miles (2%) are gravel, 4,203.0 miles (68%) are earth, 291.7 miles (5%) are primitive roads, and 8.5 miles (0.1%) are proposed roads.

State Roads

There are 1,595.5 miles of Arizona, New Mexico, and Utah state highways that provide access for the Navajo Nation and connections to the surrounding region. State routes are main arterials/thoroughfares of the Navajo Reservation linking the nation's capital, Window Rock, Arizona and the other Navajo population/growth centers.

State highway systems on the Navajo Reservation include 937.1 miles in Arizona, 590.8 miles in New Mexico, and 67.6 miles in Utah. All state highways are paved roads except for the NM57 of which its entire length of 40.1 miles is earth.

County Roads

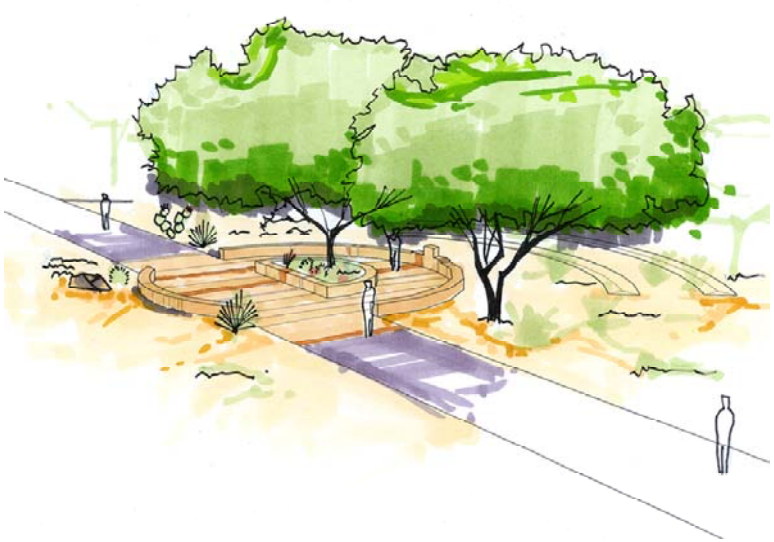
County roads on the Navajo Reservation are primarily local collector roads extending from nearby off reservation communities. The majority of county roads are in the Navajo Eastern Agency and Checkerboard areas of that agency where they provide access to Navajo Chapter areas. Other county roads are in Chinle, Shiprock, Western, Ft. Defiance, and NIIP Agencies respectively. Of the total 1,907.5 miles of county roads, 1,511.1 miles or 79% are earth roads, 110.3 miles or 6% are gravel, 134.9 miles or 7% are paved, and 151.2 miles or 8% are primitive roads.

Other BIA Program Roads

This category describes a small group of roads, of which rights-of-way belong to various programs in the BIA (i.e., Forestry, BIA schools and facilities). Of the total 46.9 miles, 16.1 miles are earth roads and 30.8 miles are paved roads. There are no roads under this category in Eastern, NIIP, and New Lands Agencies.

Other Federal Agency Roads

These roads are under federal agencies, e.g., National Park Service (NPS), BLM that own land/properties within the boundary of the Navajo Reservation. Of the total 37.2 miles, 12.3 miles are earth roads and 24.9 miles are paved roads. There are no roads under this category in Shiprock, NIIP and New Lands Agencies.



Other Roads

This category describes other private and public roads not included to any other categories previously described, such as petroleum and mining, and utility companies. There are only 0.8 miles of other roads in the Western Navajo Agency.

Existing Traffic Volume

The Navajo-BIA road system is generally characterized as rural low volume roads. Out of a total of 6,147.9 miles of the Navajo-BIA roads, 46 percent or 2,831.4 miles have average daily traffic (ADT) volumes less than 250 vehicles per day (vpd). Approximately 2,830.3 miles of these have an ADT volume between 50-249 vpd and 1.1 miles of these have an ADT volume less than 50 vpd.

Approximately 28 percent, or 1,742.9 miles of the Navajo-BIA road system have ADT volumes between 250-9999 vpd, and 0.1 percent, or 4.9 miles have ADT volumes of 10,000 vpd and greater.

Traffic Demand Forecast

Twenty-Year Traffic Volume

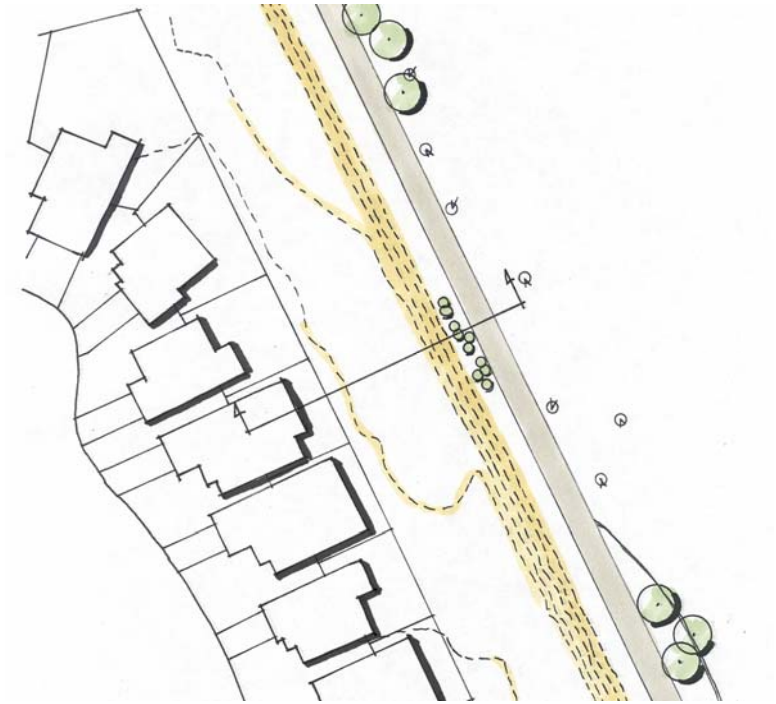
The 2008 Navajo Region Road Inventory Field Data Module (RIFDS) estimates a 2% annual traffic growth rate for all Navajo-BIA roads. Similarly the Arizona Department of Transportation (ADOT) also estimates and uses a 2% annual traffic growth rate for all state routes on the Navajo and Hopi reservations.

Based on this projected traffic growth, within the next 20 years 39 percent, or 2,420.9 miles, of Navajo-BIA roads will have ADT volumes between 250-9999 vehicles per day (vpd) and 0.2 percent, or 11.9 miles, will have ADT volumes of 10,000 vpd and greater. The majority, 60 percent or 3,715.1 miles, will have ADT volumes between 50-249 and 1 percent, or 44.7 miles, will have ADT volumes less than 50 vpd.

The 2009 LRTP shows a significant increase in the next 20 years in Navajo-BIA roads mileage with ADT volumes from less than 50, 50-250 vpd, 250-9999 vpd and those with ADT volumes of 10,000 vpd and greater.

Estimate of Daily Persons-Trips

For planning and estimating purposes, it is assumed that drivers on Navajo-BIA roads follow rural vehicle occupancy patterns, with 1.5 persons per vehicle for passenger cars and one (1) person per vehicle for trucks. ADOT uses these same figures in its planning for state highways on the Navajo Nation.



Estimate of Current and Future Modal Split

Modal split for Navajo transportation is virtually insignificant. Of the total 45,435 Navajo Nation residents commuting to work, 34,824 or 77 percent drove alone to work, 5,394 or 12 percent carpooled, 2,154 walked, and only 288 or 0.6 percent used transit to go to work (Census 2007, American Community Survey). Similar percentages are expected for the future because of the Navajo Nation's rural setting and vast distance between communities.

Travel Patterns

Based on the Transportation Planning Program's origin-destination survey conducted in 2001, a Navajo family has an average of 1.98 cars per household. On a weekday, commuter/driving to work trips generates approximately 41 percent of trips; driving children to school 31 percent; and school buses (picking up school children from bus stops to school) make up another 28 percent of total trips.

On average, a Navajo family makes approximately eight trips a year to healthcare facilities, and five trips a month to nearby border towns (usually on the weekend).

Major Transportation Issues

The Navajo Nation is the largest tribe in both land area and population, but due to inadequate funding for the Navajo IRR Program, seventy-six (76) percent of the Navajo-BIA road system is unpaved. Community transportation survey respondents identified the following important topics:

1. Safety improvements were the highest transportation goal, ranked above economic development, access to recreation, connection to transit and connection to freight;
2. Safety improvements (roadway striping, signage, traffic control, guard rail and street lights);
3. Road improvements (paving existing dirt or gravel roads);
4. Road maintenance (pothole repair and blading of dirt roads); and
5. Bridge improvements.

The poor condition of local roads, coupled with increased traffic and safety issues have become a primary concern for chapters, school administrators, health care providers, and tribal and transportation leaders. Lack of paved roads has been identified as affecting quality of life.

The Navajo Nation's transportation issues above, and road inventory and other planning data form the basis for determining transportation needs. The 2008 Navajo Region Road Inventory Field Data System (RIFDS) data, Navajo Nation Census 2000 demographic data, 1999-2007 crash data, and other pertinent planning information were used to analyze and identify the Navajo Nation's 20 year transportation needs in a systematic way as part of the 2009 LRTP. Figure 4 shows planning needs assessment process of the 2009 LRTP.

Navajo-BIA Road Issues and Needs

As provided in the 2009 LRTP, the Navajo-BIA road issues and needs are summarized in the next eleven sections, described as Needs 1 through 11. The needs were developed based on available data sources and public outreach.

NEED 1: Highway Geometric Design Deficiencies

To meet the Navajo IRR program objectives, design and construction of roads, bridges, and other transportation facilities must be done to current acceptable engineering standards for anticipated 20-year traffic volume.

Based on the highway geometric design guidelines and 20-year projected traffic volume, of the total Navajo-BIA roadway system, 97 percent of total Navajo-BIA road system or 5,955.4 miles have geometric design deficiencies including upgrades in road geometry, surfacing, and/or highway capacity.

Need 2: Network Connectivity Needs

BIA Class 1 (Major Arterial), Class 2 (Rural Minor Arterial) and Class 4 (Rural Major Collector) roads together work to provide network connectivity from Class 5 (Rural Local) roads to population centers, state road systems and regional network. However, the connectivity of Navajo-BIA roads system is hardly efficient due to the fact that much of these roads are unpaved: 11 percent of the Navajo-BIA Class 2 roads; 83 percent of Class 4 roads; and 93 percent of Class 5 road are unpaved.

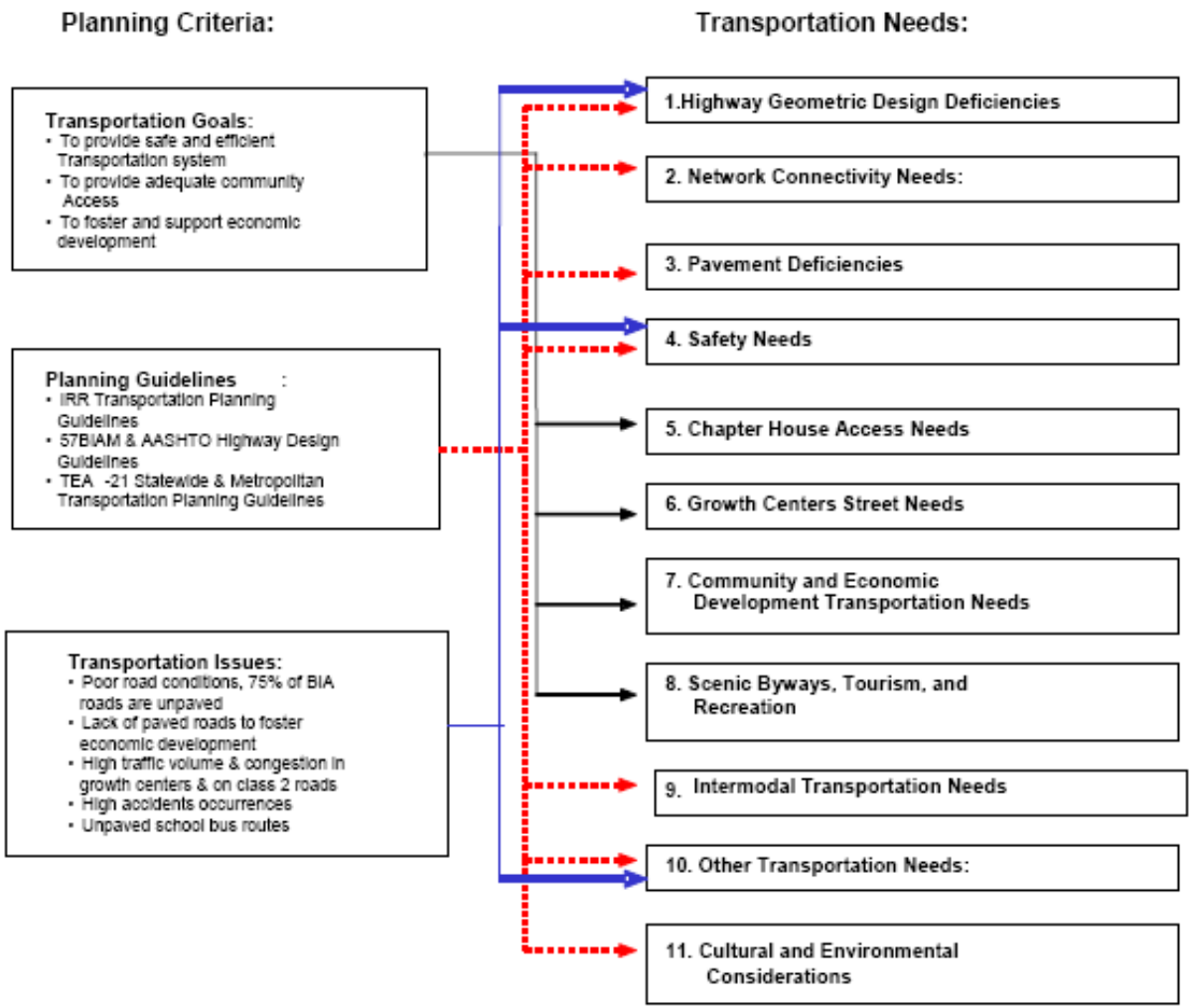
Missing roads or gaps in the transportation network clearly show that the paved segments are not continuous throughout the network thus demonstrates poor continuity or inefficiency of the network when the arterials and major collectors are not paved.

Need 3: Pavement Deficiencies

Of the total 6,147.9 miles of Navajo-BIA roadways, 24 percent or 1,494.4 miles are paved. To meet the Pavement Management System (PMS) requirement, pavement deficiencies of Navajo BIA road sections were identified based on BIADOT wearing surface or pavement rating standards.

Per the 2008 inventory, a total of 1,313.8 miles of Navajo BIA paved roads have pavement and/or design deficiencies and require reconstruction of the roadway. There are 1.3 miles of Navajo BIA paved roads that have moderate pavement deficiencies and require pavement rehabilitation, while 26.3 miles require minor rehabilitation. A total of 153.0 miles have slight deficiencies or are in good surface condition and only require routine maintenance to extend the life of their pavement.

Figure 4:
2009 LRTP Planning Needs Assessment Process



Source: 2009 Navajo Nation Long-Range Transportation Plan, Arizona Tribal Transportation.

Need 4: Safety

BIA policy requires that IRR program development include identification of sites with high crash potential so they can be brought to the attention of road design engineers. Another requirement is identification of sites with high crash occurrences so that safety projects or a highway safety program can be developed to help reduce the number of crashes.

The 2007 Motor Vehicle Crash Facts prepared by ADOT reports that Native Americans made up 15.34 percent of total crash fatalities (the third largest group after White and Hispanic), while their population was only 5.25 percent of Arizona. This indicates the seriousness of traffic crashes and safety issues on the Navajo Nation.

In the years 1999-2007, a total of 11,273 traffic crashes occurred on the Navajo Nation. The majority of the crashes happened on state and Navajo-BIA roads. Approximately 52.3 percent or 5,899 crashes occurred on state highways; 41.4 percent or 4,669 crashes on Navajo BIA roads; 3.7 percent or 414 crashes on county roads; 1.6 percent or 182 crashes on other public roads; and 0.8 percent on other tribal and government program roads.

A total of 1,200 crashes or 10.6 percent of all crashes occurred at turnoffs or access to development (stores, schools, etc). The Navajo Nation growth centers commercial strips were high among places where crashes occurred. Traffic congestion at multiple access points to convenience stores, fast food restaurants, banks, and shopping centers seemed to be a cause of crashes on main highways within the Growth Center communities. Lack of street lights and access control seemed to be a cause of crashes in these communities. Commercial strips in the growth center areas experienced high number of crashes.

Locations of Frequent Crashes at Development Access

The 2009 LRTP reported the intersection of US160/US163 in Kayenta as one having high accidents with a number of 41 accidents recorded. In addition, the 2009 LRTP reports location with frequent crashes at development access resulting from poor access management. Of the total crashes reported at development access points, 148 crashes occurred along US 163 and 34 crashes occurred within US Highway 160 in Kayenta Township.

Turns offs to schools, chapter houses, and tourist attractions were other locations where crashes occurred frequently. NHA housing access roads also produced significant numbers of crashes. This plan classifies crashes at turnoffs to NHA housing sites as intersection crashes. Lack of accelerating and decelerating lanes and poor lighting may have contributed to the cause of these crashes.

Need 5: Chapter House Access Needs

Accessibility is a federal policy guiding IRR program development.3 Accessibility to local government and services is an issue in every one of the Navajo Nation's 110 chapters. The Navajo Nation and BIANRODOT have an affirmative responsibility to provide all-weather access to chapter houses that provide community based government services and facilities.

The 1998 Navajo Nation Local Governance Act (LGA) allows the decentralizing of the Navajo Nation government's authority and functions to the chapters. When a chapter house becomes a center for government services and functions, traffic to it will be dramatically elevated. Aside from housing government programs, a Navajo chapter house is a central place in Navajo community life. A chapter house is where residents can use telephones, pick up mail, receive personal messages, have meetings and social gatherings. Other community facilities such as recreation areas, nursery, schools, housing, and business sites, are generally situated nearby.

Sixteen (16) chapters still lack paved access roads to their chapter houses. Access roads to these chapter houses are impassible during severe weather. A total of 164.8 miles of roads providing access to chapter houses are unpaved. These unpaved access roads include149.8 miles of BIA Class 4 roads and 15.0 miles of County roads.

Need 6: Growth Center Street Needs

IRR Program planning regulations require that long range transportation planning consider impacts of existing and future traffic generators and land uses. Navajo Nation policies, combined with population growth are driving development of the Navajo Primary Growth Centers. Expansion of infrastructure, including transportation systems, will be required to support this development. While many of Navajo primary growth centers qualify as small urban areas (a community with a total 5,000 population is classified as a small urban area), their transportation systems typically are comprised of only a few paved roads. A typical Navajo Primary Growth Center transportation system consists of a state highway and/or a Navajo-BIA Class 2 road, NHA housing subdivision streets, short access roads to government facilities, and miscellaneous unpaved system and non-system roads. Table V-16 shows existing signalization, miles of streets and street lights at the Primary Growth Centers.

Future Transportation Needs:

Population at Navajo Primary Growth Centers Community is estimated to increase at 2.5 percent growth rate annually. Shiprock, Tuba City, Chinle, Kayenta, Fort Defiance, and Window Rock will be among the most populated communities with populations well over 5,000. School, healthcare, and other community services will be needed as well as employment and economic development. Existing traffic congestion has already strained the main streets in Growth Centers. Traffic crashes were reported high on the primary growth centers' main streets. More streets and an efficient street network are needed for each primary growth center to provide alternate routes in order to reduce traffic congestion and accidents.

Need 7: Community Economic Development Transportation Needs

To meet program objectives, IRR must provide access to development and for land use. Health care facilities, public residential projects, schools, shopping centers, industrial development, coal mines, etc. generate considerable traffic. They are major community and economic development providing employment and are major traffic generators on the Navajo Nation. Access as well as safety improvement needs for existing and future development must be taken into consideration when preparing land use and transportation maps.

Health Care Facilities

Navajo Area Indian Health Service Existing Facilities

The Navajo Area Indian Health Service (NAIHS) is the primary health care provider on the Navajo Nation. NAIHS program administration is divided into 8 service units: Chinle, Crownpoint, Fort Defiance, Gallup, Kayenta, Shiprock, Tuba City, and Winslow Service Units. Within these service units, NAIHS facilities include 6 hospitals, 9 health centers, 12 health stations, and 18 dental clinics (2007) (see Map V-10). NAIHS also provides over 50 primary care services at schools and about 60 at Chapter.

Other health care facilities are contract facilities located within or near the Navajo Nation. These include Sage Memorial Hospital (Ganado, AZ), Presbyterian Medical Services (Cuba, NM and Farmington, NM), Winslow Memorial Hospital (Winslow, AZ), and San Juan Health Care Services (Montezuma Creek, UT). These facilities generated approximately 78,000 outpatient visits and 2,300 inpatient admissions annually. Others are private facilities, mostly small dental clinics, and one private clinic provides family care in St. Michael, AZ.

Navajo Area Indian Health Service Proposed Facilities

NAIHS has proposed replacement and new facilities to meet its short and long range goals. In its FY2011 IHS Planned Health Care facility Construction Budget, NAIHS proposes outpatient facilities for underserved areas of the Navajo Nation. Table 13 summarizes existing and proposed NAIHS facilities on the Navajo Nation.

As provided on Table 13 the new Kayenta Health Care Facility is currently under construction. This healthcare facility will include 129 staff members per quarter units and will generate considerable amount of traffic. Navajo communities depend on transportation to provide access to health care facilities for emergency and routine care. Road development priority should be given to the maintenance and improvement of roads serving health care facilities, especially roads that are major routes for emergency care and air and ambulance transport. To accomplish this, the reservation road network must be efficient, in good condition, and well maintained.

Table 13
Proposed NAIS and Contract Health Care Facilities

Estimated Opening Year	Proposed New Facility/ Staff per Quarter Units	Chapter
2012	Kayenta Health Center/129	Kayenta
2020	Dilkon Health Station/109	Dilkon
2014	Alamo Health Station/33	Alamo
2015	Pueblo Pintado Health Station	Pueblo Pintado
2014	Bodaway Gap Health Station	Gap/Coppermine

Sources: NAIHS Profile 2007, Navajo Nation Long Range Transportation Plan, 2009

Residential Development

NHA housing subdivisions are major traffic generators throughout the reservation. The Navajo Housing Authority (NHA), funded by the federal Department of Housing and Urban Development (HUD), is the major tribal agency building housing for low income families. NHA has planned and constructed less of subdivision housing and more of scattered homes recently. NHA however, cannot provide any planned NHA housing development for the 2009 LRTP update.

Schools

In 2006-2007 school year only 46 percent or 42,492 of total 92,260 Navajo Nation school children attended 140 public schools located on the Navajo Nation. Of these, 80 are public (state/county) schools and 60 are BIA schools (these figures do not include private, church schools and headstart programs).

The other 54 percent attended public schools at Border Towns such as Flagstaff, Winslow, Holbrook and Page in Arizona; Gallup, Cuba, Aztec, Bloomfields and Farmington in New Mexico; and Mexican Hat and Montezuma in Utah.

Economic Development

The Navajo Nation Division of Economic Development has three major development goals for the near future: industrial, tourism, and commercial and real estate development. Development in these areas will produce base industry growth and job creation.

Industrial Development

Economic development and manufacturing is considered to be the most important aspect of industry. There are five industrial plants in operation on the Navajo Nation:

- Raytheon at the NAPI Industrial Park.
- MechTronics of Arizona in the Fort Defiance Industrial Park.
- TDI in the Leupp Industrial Park.
- Southwest Cabinet at the Church Rock Industrial Park.
- Gallup Camper Sales.

Considering the paramount importance of manufacturing, the Division is actively recruiting new industrial businesses, of which the important ones are:

- Latex Glove Manufacturing Plant
- Montezuma Creek Sewing Factory
- BCDS Manufacturing Operation
- Housing Panel Manufacturing
- Indian Tribal Economic Alliance (ITEA)

Tourism Development

Tourism has the potential of generating a substantial amount of income for the Navajo Nation. According to a recent study, the tourism industry has an economic impact of $100 million dollars and supports 3,506 jobs. To promote tourism in the Navajo Nation and to capture more of the tourist dollars, the Navajo Nation Division of Economic Development has planned a number of projects:

- Completion of Phase II and Phase III-Antelope Marina & Resort
- Shiprock RV Park
- Monument Valley Interpretive Center
- Dine Biitah Scenic Road
- Dine Tourism Corridor

Commercial and Real Estate Development

Office and retail space development has been initiated by Chuska/Sahara, utilizing private financing and using the Bureau of Indian Affairs loan guarantee program at various sites. The sites are:

- White Cone Commercial Development - Phase I development is in the bid process to prepare a acre tract of land in White Cone, AZ, a southwestern community for future business. The target business is an 8,000-10,000 square foot retail center that includes a gas station, convenience store, laundry and a small sit-down eating operation.
- Karigan Housing Development Phase II - Phase II development of housing on Karigan Estates in St. Michaels, AZ began in July, 2004. The project is a continuation of home ownership on fee lands located at Karigan Estates.
- Sawmill Retail Center - Site Development for a small retail center currently being advertised for bids. Attract business for the 3.0 acre tract of land in Sawmill, AZ includes a gas station and convenience store.
- Newlands Shopping Center - Infrastructure planning and development to accommodate a future full-scale shopping center at Sanders, AZ is in the architect and engineering stages. The project will provide for tenant recruitment and construction of a commercial facility to accommodate the Newlands community.
- Tuba City Office and Retail Complex (42,000 sq. ft.) Completion date is June, 2004
- Kayenta Office and Retail Complex
- Shiprock Office and Retail Complex
- Dilkon Office and Retail Complex
- Fort Defiance Office and Retail Complex
- Crownpoint Office and Retail Complex

In addition to the Division of Economic Development priority projects, several Chapters have also planned several more economic development projects for their chapters to be funded under Capital Improvement Programming. The Navajo Nation Gaming Enterprise has also proposed to build three more casinos.

New access roads, turnoffs, traffic signals, street lights, and accelerate/decelerate lanes are recommended for safety and accessibility for these planned economic developments. Overall transportation system connectivity is also crucial to the Navajo Nation's economic future. Without an adequate transportation system, the Nation's future economic growth will be severely constrained.

Energy Development

Energy development is now an important part to the Navajo Nation's overall economic development strategies. The Dine' Power Authority (DPA) oversees energy development for the Navajo Nation has proposed four major projects as follows:

- **Navajo Transmission Project:** The Navajo Transmission Project (NTP) is a 469-mile high voltage transmission line to supply electricity from the Four Corners region power plants to Arizona, Nevada and California substations. This project will supplant the aging existing transmission system eliminating a supply gap in the Southwest grid and providing stability and reliability in the event of outage and impacts to the power plants.
- **Desert Rock Power Plant:** Desert Rock is a coal-fired 1,500 megawatts (MW) power plant planned to start operating in 2010. The project is located in Burnham Chapter. The power plant will create 400 jobs. The project will add commuter and heavy truck traffic impacting N5082, N5, NM371 and US491. There is also a proposed road to be built by BHP Billiton Navajo Coal Company to provide access to its mining sites north of the Desert Rock plant and to Desert Rock Power Plant access road. This road will replace approximately 18.4 miles of N5082 north of N5.
- **Dine' Wind Project:** DPA has identified potential three (3) high wind resource sites in Grey Mountain/Cameron, Oljatoh/Kayenta and Black Mesa areas. These sites have strong wind that can generate electricity of 200-700 MW, 50-100 MW, and 50-100 MW respectively. Aside from Wind resource, DPA also found potential sites for solar energy development.
- **Coalbed Methane Production Plant:** The Navajo Oil and Gas Company is hoping to add revenue to the Navajo Nation's coffer by planning to tap into more than 220 billion cubic feet gas reserve in the San Juan Basin. This is a methane gas reserve underneath Upper Fruitland, Nenahnezad and San Juan Chapters. The project will be located east of the BHP Billington Mine and includes gas gathering and compression station. The product will be delivered into some of the existing major interstate pipelines that already exist on the Navajo Nation.

Community Development:

The Navajo Nation and its chapters are actively pursuing community development. The majority of the Navajo Nation Capital Improvement Program (CIP) projects are located within the chapter house tracts.
Paving the access roads to chapter houses will also provide better transportation access to these facilities. The LRTP 2009 lists Navajo Nation CIP projects with related transportation needs for each CIP project. These CIP projects include construction and access of the detention building along US Highway 163 in Kayenta.

Need 8: Scenic Byways, Tourism and Recreation Needs

Tourism is a major industry that can generate $100 million dollars and it supports 3,500 jobs on the Navajo Nation according to the Division of Economic Development. To promote tourism on the Navajo Nation, the Navajo Nation Tourism Department has developed a comprehensive Navajo Nation Scenic Byways Plan identifying scenic routes that links all of the Nation's attractions that are most scenic, culturally significant and have naturally intrinsic qualities. Among these are the:

- Canyon de Chelly National Monument,
- Lake Powell,
- Monument Valley,
- Navajo National Monument,
- Antelope Canyon,
- Four Corners Monument and
- Chaco Culture National Historical Park.

These natural and cultural resources have provided new sources of income to Navajo people and the surrounding communities. The Navajo Nation Tourism Department, Parks and Recreation, Navajo Division of Transportation, Chapters and Non-profit organizations all support scenic byways development and provide matching funds to state and federal grants in order to implement the Navajo Nation Scenic Byways plan and projects.

Scenic Byways and Projects

The Navajo Nation Scenic Byways Plan shows the Navajo Nation designated scenic byway corridors. Each corridor has been named based on its intrinsic quality whether it is natural, scenic or of Navajo cultural and historical characters. Transportation improvements that are needed to enhance and support each byway development project.

Recreation

The U.S. National Park Service operates the Canyon De Chelly National Monument, Lake Powell, Chaco Culture National Historical Park and Navajo National Monument. The Navajo Parks and Recreation Department, established in 1958, manages tribal parks, monuments, a zoo, five fairgrounds and administers fair events and youth recreational programs.

Many Navajo parks and recreation areas have poor access. Lack of reasonable access to most Navajo recreation sites, many of which are potential tourist attractions, has discouraged their use. The Navajo Parks and Recreation Department's revenue is mainly generated from entrance fees collected from Monument Valley Tribal Park and tribal fairs. Other park facilities have no entrance fee. Revenues are primarily used for facility maintenance, and are often insufficient to cover major road improvements.

Improvement of access roads to tribal parks and tourist attractions will attract more park users and tourists alike. Good roads to the tribal parks will also extend tourists' time of stay because there will be more places to explore and things to do.

Need 9: Multimodal Transportation Needs

To meet SAFETEA-LU requirements regarding multimodal transportation, transportation planning must promote the use of other modes of transportation. The multimodal needs related to sidewalks and bicycle mobility in the growth centers are included in the Growth Center Mobility Improvements section. Need 9 focuses on aviation, railroad and transit related improvements only.

Airport Access Needs

The 2009 LRTP lists Navajo Nation airport development needs and provides recommendations based on State aviation studies and Navajo DOT estimates. The recommendations include new construction of one primary airport in Oljatoh and improvement of eight (8) secondary airports in Ramah Navajo, Rock Point, Navajo Mountain, Monument Valley, Huerfano, Pinon, Dilcon, Alamo and Nahat'a Dziil (New Lands) communities. Priority will be given to the primary airports that are already recognized by the Federal Aviation Administration (FAA) in its National Plan of Integrated Airport Systems (NPIAS) and are therefore, eligible for FAA funding. However, improvement and new construction of secondary airports are also recommended to provide air transportation to health care facilities and provide emergency landing strips in remote areas. The planned airport developments will help improve air service coverage for the entire reservation including Navajo satellite communities such as Ramah. Approximately 8.5 miles of new access road construction and paving of existing roads are needed to serve the proposed airport development.

Navajo Transit Route Needs

Navajo Transit System Five Year Plan

According to the Navajo Transit System Five Year Plan dated May 2009, ridership in 2008 was approximately 70,000 trips per year; however, it is forecasted that there is an estimated demand for transit of nearly 700,000 one-way passenger trips per year. The plan addresses five key areas: Management/Administration, Operations/Service, Marketing, Coordination, and Funding.

The Navajo Transit System (NTS) provides public transportation services on the Navajo Reservation, serving 57 of 110 chapters. NTS operates intercity bus service on (13) fixed routes linking Navajo growth centers and adjacent border towns. The Tuba City-Window Rock, Toyei-Window Rock, Kayenta-Ft. Defiance, Crownpoint-Ft. Defiance, Dilkon-Window Rock and routes operate one round trip per day Monday to Friday. Window Rock and Gallup routes are core service routes operating four and two round trips each weekday, respectively. In January 2009, the Flagstaff to Tuba City Route was started; this is a one hour trip that will run four times per day. In 2009, the Kayenta to Tuba City route began to provide a one-hour, one-way trip.

NTS connects with Hopi Transit System, Greyhound Busline, Amtrak Passenger Train, Gallup Transit Express, Red Apple Transit, and Flagstaff Mountain Line. NTS has several connections with Navajo Senior Centers along the routes. Most NTS fixed routes operate along state highways. NTS fixed route ridership has increased over the years. Ridership was 65,513 in 2008 and it is expected to increase by 20 percent in FY 2009, due to the $1.00 per day ride fee that was established in November 2008 and will remain in place until November 2010. Fixed route customers are classified as 51 percent general, 22 percent elderly, 20 percent commuters and disabled, youth and students making up the rest. NTS buses pick up riders at designated stops, but no NTS stations have been constructed. NTS charters provide transportation for groups, organizations and private tours on and off the Navajo Nation twelve months a year. NTS charter service includes transportation to Arizona State University, University of New Mexico, Haskell University, and other colleges.

At the public open house meetings held for the LRTP, many people noted that there was a need for additional signage to designate the available transit routes, the stop locations, and the schedules. It is recommended that a transit signage program be pursued to encourage ridership and awareness of the transit system that is available.

Navajo Transit provides long-haul type routes between the population centers. Additional investigation should be done to identify if local circulator, call-n-ride or other short trip/demand response type system is supportable with in the growth centers.

Transit System Long Range Plan

The Navajo Transit System (NTS) Program under the Division of General Services completed the NTS Five Year Plan in 2009. The NTS plan projects transit demand to increase at 1.4 percent annually estimating approximately 700,000 passenger trips, generally for and between the primary and secondary growth centers in 2025. The plan outlines strategic goals and objectives for NTS to meet the future demand including increasing ridership and enhancing service quality, capabilities and efficiency. Implementing the NTS strategic plan will be a long-term activity.

The Navajo Transit Long Range Plan recommends construction of eight (8) Regional Transportation Hubs. These facilities will serve as the central location for feeder bus routes to neighboring chapters and secondary growth centers. Kayenta is one of the potential locations listed for a Regional Transportation Hub.

The Transit Long Range Plan also recommends adding Trunk Routes to connect a significant amount of the Reservation's population together in a network of intercity bus routes. These trunk routes include the Kayenta-Tuba City Trunk Route and the Kayenta-Page Trunk Route.

Arizona Rural Transit Needs Study

The State of Arizona Rural Transit Needs Study provides regionally-based solutions to rural public transportation in Arizona. The Study intended to serve as an objective, analytical basis for establishing Arizona's long-term strategic direction of rural transit service provision. The study found that transit demand in rural Arizona is projected to increase 34 percent from year 2007 to 2016. There are numerous unmet needs for rural transit services in Arizona. Only 18 percent of the estimated demand for rural transit services is currently being met; while only 13 percent is projected to be met by year 2016. Thus additional rural transit service is needed to meet future demand. Establishing roles and responsibilities between the State, COGs, local governments, tribal governments and transit operators will facilitate the development of public transportation service in rural Arizona.

The study noted that additional rural transit services are needed in multiple cities, town, Tribal Reservations, and intercity corridors throughout the State of Arizona. The key market segments should be elderly persons, persons with disabilities, and persons of low income. The primary purpose for rural transit trips include medical appointments, shopping, work, education, personal business and recreation. These findings are consistent with the Navajo Transit System study, discussed previously.

The study documented that expanded 5311 local program services have been identified for the Navajo Transit System, namely between the cities of Flagstaff and Tuba City, Tuba City and Page, and Tuba City and Kayenta.

Road Improvement Needs

To support the implementation of the NTS long range strategic plan, assuming all of the new truck and feeder routes are established, road improvements of these existing and future NTS routes would ensure safety of both transit riders and general public. Routine pavement preservation is needed on NTS routes to keep them in good condition and safe.

Most of the existing NTS Fixed Routes operate on State highways with three routes on N59 from Many Farms to US160; N12 from Navajo, NM to Window Rock; and N9 from US491 to Crownpoint. The NTS Long Range Plan has also proposed numerous Feeder Routes to provide additional transit services to smaller communities. These are communities with 5,000 - 10,000 transit trips per year and are appropriate for feeder transit services using smaller vehicles to operate on an ad-hoc basis.

Paving chapter house access will provide all-weather roads for most of the needed feeder routes. Improvement of IRR routes used for transit operation is necessary for safety of NTS riders and traveling public sharing the roads.

Railroad Need:

The Burlington Northern Santa Fe (BNSF) railroad runs along interstate I-40 south of the reservation, and is the only major freight and passenger railroad crossing the Navajo Nation. BNSF connects Albuquerque, NM to the west coast at Los Angeles, CA, and crosses the Navajo Reservation at Nahat'a Dziil (New Lands) Chapter, Church Rock Chapter and checkerboard area in the Eastern Navajo Agency.

Freight trains and Amtrak share the BNSF railroad, with stations/stops in Flagstaff, AZ and Gallup, NM. Rail development is complex and involves various businesses (freight and passenger rail companies), government entities, as well as economic considerations (demand versus supply).

Need 10: Other Transportation Needs

These are transportation needs related to or identified in other tribal and state plans. They include plans to implement rural addressing, to provide emergency services during snow and mud emergencies and hazardous shipment accidents, to provide road access in regions that are underdeveloped because of land disputes, to improve non-system public roads, proposed state and regional transportation plans.

Rural Addressing

The Telecommunications and Utilities Department under the Division of General Services is taking a lead in the Navajo Nation 9-1-1 and Rural Addressing. Its primary goal is to link each telephone number to a physical address in order to enhance efficiency of emergency and public safety responses to 911 calls. A pilot project is being implemented in Tohajiilee with New Mexico State funds for addressing, road naming and signage installation.

Snow and Mud Emergencies

Much of the Navajo Reservation soils have high clay content and little ground cover and a large number of the unpaved Navajo-BIA roads pass through low lying areas where snow and rain water collect. Navajo Nation residents thus encounter snow and mud emergencies almost every winter and spring. The majority of Navajos live in scattered homes raising sheep and cattle for supplemental income. Families, seniors and school children getting stranded for days or even weeks due to impassible roads has become a norm of life on the Navajo Reservation. Emergency rescue operations are often difficult or delayed until the weather permits.

The Navajo Nation needs more paved roads and maintenance funds to keep roads passable, to reduce the snow and mud emergencies. It needs to build a network of all-weather roads to serve those areas of the reservation where the people live.

Hazardous Materials Shipments

U.S. Department of Energy (DOE) programs transport approximately 5,000 shipments annually of nonclassified radioactive materials and waste for cleanup, research, and development for medical or industrial uses and national defense purposes. The DOE Waste Isolation Pilot Plant near Carlsbad, NM disposes of transuranic waste shipments from other DOE sites. US 666 and I-40 are the main DOE shipment routes going through the Navajo Nation. DOE reported 22 and 50 shipments of hazardous materials through the Navajo Nation in 1998 and 1999 respectively.

Numerous other hazardous material shipments from private and public sectors also cross the Navajo reservation. Emergencies involving hazardous material releases and transportation of such materials across the Navajo Nation have been reported (U.S. Environmental Protection Agency, Region IX). State highways on the Navajo Nation are major hazardous material shipment routes. To make hazardous material transportation on the Navajo Nation safe, all shipment routes should be paved. Approximately 10.5 miles of N4 from Pinon to the Hopi reservation needs to be paved, so all hazardous shipments can be shipped on paved routes. This will improve safety and pose less danger for the surrounding Navajo communities. Routine maintenance for these routes is also necessary to keep them safe.

Other hazardous material shipments are transported by the Burlington Northern Santa Fe (BNSF) Railroad crossing the southeast corner of the Navajo Reservation. Approximately 14,000+ shipments of hazardous materials are transported annually on the BNSF

ADOT I-40 Emergency Plan

ADOT has developed an I-40 Emergency Interstate Closure Plan (Map V-16) to detour traffic around Interstate closures in cases of emergencies. These plans would only be used in extreme situations such as earthquakes, hazardous material spills or complete roadway failures. The Navajo BIA routes that are part of the I-40 detours are: N15 from the reservation line west of Leupp to AZ264/US191 intersection in Burnside, N6 from AZ77 at the reservation line to N15 intersection 6 miles north of Bitahochee, and N12 from I-40 in Lupton to St. Michaels.

To safely accommodate heavy traffic during the I-40 emergency detours and prevent pavement deterioration due to excess load, these Navajo routes will need pavement and sub-base reconstruction, redesign of culverts, and roadway widening for N15 and N6 (N12 has been reconstructed and met standards). Estimated detour period is 48 hours with 8,000 trucks per day (ADOT, Holbrook District).

The proposed emergency detours cross 1 bridge on N6, 3 bridges on N12, and 8 bridges on N15. All 12 bridges are rated in good condition and meet standard design load and operating ratings. These IRR bridges should safely carry detour traffic without improvement. However, these bridges are not new and for safety reasons, no more than one truck should be allowed to cross a bridge at a time at a speed no greater than 35 miles per hour.

Need 11: Cultural and Environmental Considerations

IRR long-range transportation plans are required to consider the impacts of existing and proposed transportation system on the environment, and balance the needs of development and the environment (i.e., wildlife, plant life, clean air and water, etc.). This Navajo Nation's cultural and environmental resources are protected under the National Historic Preservation Act, NEPA, Endangered Species Act, Clean Water Act and Clean Air Act. They are considered as follows.

Archeological and Historical Resources

Any federally-funded action requires the identification and evaluation of historic properties in accordance with the requirements of Title 36, Code of Federal Regulations (CFR) Part 800, Section 106- the review process established in the National Historic Preservation Act. Title 49, United States Code (USC), Section 303 (originally Section 4(f) of the Department of Transportation Act of 1966) specifies that special efforts be made to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges and historic sites. For these reasons, listed or eligible historic properties and areas expected to have high density of historic properties have been identified as important considerations associated with the transportation planning of the Navajo Nation.

The entire Navajo Nation is rich with archeological and historical resources. Evidence of prehistoric Navajo habitation on the present day Navajo Reservation and surrounding area is recorded in various archeological investigations, studies required for development on the reservation, the Navajo and Hopi land dispute litigation and fuel resources development. These archeological investigations, including studies of Navajo migration, and other publications cite evidence of Navajo settlements throughout the region. In general, the Navajo settlement in the area ranges from one ruin per 4 square miles for highest density site to one ruin per 33-167 square miles. The concentration of ruin sites appears to be related to pinon-juniper zones where hunting, gathering and alluvial farming could be practiced.

Evidence of Hopi and Anasazi occupations is also found near the Hopi reservation and the surrounding areas making the Navajo lands bordering the Hopi Reservation particularly rich in archeological and historical sites. This greatly impacts planning of the road construction. Clearances of past road construction projects have taken longer time due to the many archeological sites.

Planning for new road construction, such as new street expansion for Growth Center communities (NEED 6) and proposed airports' access roads (NEED 9) will require longer time for archaeological clearance. Other road construction projects involving widening or realignments such as N7 from Canyon De Chelly to Sawmill (NEED 1), N4 from Pinon to Hopi Reservation (NEED 10) will also be subject to additional archeological clearance work thus, will need extra project planning time.

Wildlife

The Navajo Nation is unique for its natural resources. It is a large Indian reservation with low population and development density and a rich natural environment. The reservation has become a sanctuary for wildlife, rare animals and plant life. The Fort Defiance Plateau and Chuska Mountains have been identified one of the Arizona habitats for the endangered Mexican Spotted Owls.

The Endangered Species Act protects populations and habitat of a variety of listed species of plants and animals on federal lands. The Navajo Reservation, as trust land, is subject to all provisions of the Act. All projects on the reservation which require federal or tribal review, even commercial and home site leases, must be reviewed for possible impacts on listed species. These must be documented in the Environmental Assessment (EA), which accompanies the project documents in the review package.

Planning and design of road projects must meet the Endangered Species Act requirements when applying for right of way clearance. Project planning should provide enough lead time for a lengthy review process and required species surveys. When planning for widening of an existing roadway, environmental clearance will be required as well.

Three years should be a nominal time for project R.O.W clearance in general. Proposed road projects in Fort Defiance Plateau and Chuska Mountains such as N13 over the Buffalo Pass will require a lengthy survey and review process since it is in sensitive habitat. The road R.O.W. width should also be reduced to the minimum requirement to minimize impacts to the habitat of the endangered species.

Wetlands

Federal law on wetlands (E.O. 11990) mandates protection of all wetlands on public lands. Wetlands in an arid region are groundwater recharge areas. Wetlands house rich wildlife habitats and plant communities. Wetlands that are part of drainage channels/systems are crucial to the overall drainage system. They connect the system and maintain the existence of the ecosystem. Wetlands contribute to groundwater recharge. Alluvial deposits such as in wetlands allow water to infiltrate through underlying rock fractures, allowing the recharge of ephemeral streams. Wetlands in high altitude/headwater areas that are often found interwoven with forested areas allow water to percolate through underlying unconsolidated rocks.

The Navajo Nation wetlands are of both permanent and seasonal characteristics influenced by its climatic condition, drainage pattern and soil development. Permanent wetlands are found along washes and major drainage channels such as the Little Colorado River, San Juan River, Chaco River and Chinle Wash and their tributaries. Most seasonal wetlands are often a part of pond and lake system.
The Nation wetlands are found more in the eastern region than in the western part of the reservation. The majority of them are found around headwater areas in the Defiance Plateau, Chuska and Carizzo mountains. Others are often small sparse ephemeral wetlands created by seasonal floods or rain storms. Wetlands in the western region are found at high altitudes where precipitation concentrates, such as Navajo Mountain and Black Mesa areas. Others are perennial lakes that are part of interrupted drainage systems and ephemeral streams. There are many small ephemeral lakes, as typified in Red Lake/Tonalea Chapter along Moenkopi Wash and Tolani Lake in the Oraibi Wash drainage.

Wetlands on the Navajo Reservation are sensitive. Prolonged drought can eliminate a wetland completely. Other mechanisms that sustain wetlands include groundwater discharge, non-disruption of surface drainage system and ground cover. Destruction of wetlands may interrupt or even destroy the entire ecosystem--drainage system, plant or animal communities or drying up our water supply. Road development should avoid wetlands, especially those that are part of an overall drainage system. Road development should be carefully planned to avoid the destruction of wetlands especially at headwater recharge areas such as in the Defiance Plateau, Chuska and Carizzo Mountains and Black Mesa.

Water Quality

The federal Clean Water Act of 1972, (33 U.S.C., Sec. 1251-1376) contains provisions for regulating and maintaining ground and water surface quality. The Clean Water Act is administered by the U.S. EPA and by the Navajo Nation EPA.
The main impact of the Clean Water Act on highway development and construction is through its regulation of non-point sources of water pollution. Unimproved dirt roads erode easily, their sediments often entering surface drainage watercourses. Since a high proportion of Navajo Reservation roads are unimproved dirt, upgrading these roads could be a significant element of future Navajo Nation plans for controlling non-point source pollution of surface waters.

Future road construction projects will in all likelihood have to meet some standards for runoff control, and will require permits by Navajo EPA. Compliance with applicable Clean Water Act provisions as administered by Navajo EPA should be factored into funding and scheduling calculations for future road projects.

Air Quality

The Clean Air Act amendment of 1990 requirements applies mostly to metropolitan transportation planning. Transportation-related pollutants must be addressed in planning for an area designated nonattainment (not attained to the National Ambient Air Quality Standards) or a maintenance plan must be implemented under Clean Air Act section 175 A (i.e. ozone, carbon monoxide, nitrogen dioxide, and particles with an aerodynamic diameter of less than or equal to a nominal 10 micrometers, etc.). The Act requires incorporation of appropriate measures for air pollution control or congestion reduction to protect the public health. A program such as the implementation of high occupancy vehicle lane in some metropolitan areas is an example of a congestion reduction measure.

Most communities and areas on the Navajo Reservation are classified as attainment or unclassifiable, except for a small area in the northwest New Mexico that is classified as non-attainment area due to generation stations emission. Nonetheless, this is not a transportation-related non-attainment designation.

The Navajo Nation has approved its air quality codes (Air Pollution Prevention and Control). These codes mostly deal with industrial pollutants. The Navajo Nation Environmental Protection Agency is currently concerned about road construction projects. On the Navajo Reservation, air pollution from transportation-related activities is usually caused by road construction, since during road construction particulates may be produced beyond the acceptable level. The Navajo EPA follows State and Federal EPA criteria and procedures for determining conformity for the reservation attainment areas regarding road construction.

The Navajo Nation Growth Centers have become urbanized. Traffic congestion occurs briefly during rush hours in some communities because these communities are served by few roads. Development mainly clusters along the main roads or at intersections.

Growth Centers are the fastest growing communities, fueled by development planned by the Navajo Nation. These communities will need urban street systems soon to accommodate future traffic and provide even distribution of traffic to prevent air pollution caused by the traffic congestion.

Chinle, Kayenta, Tuba City, and Shiprock have high population as well as tourist traffic. Their needs for urban street systems have become apparent, especially during the tourist season.

Considerations and Needs

In all, a balance between development and protecting these delicate resources must be exercised to minimize the impacts of road construction and promote development without destroying the Navajo Nation's valuable cultural and natural heritages. A balance can be achieved through careful planning and engineering.

- **Future Transportation Plans:** Future planning such as street expansion and plans have been proposed for the Navajo Growth Centers to cope with growing population and development at these communities in the future. Good street system, such as those in other urban areas can prevent traffic congestion and air pollution by distributing traffic more evenly. No new roads are proposed to avoid opening up of new areas and disturbance to archeological, wildlife habitats, wetlands and drainage channels. Paving unimproved roads have been proposed and given priority to reduce erosion and sediments to water courses and particulate air pollution.
- **Project Planning:** Adequate time is recommended for surveys of archeological as well as environmental resources, and the R.O.W review process for most projects. Project planning should include three years for R.O.W assessment and clearance process prior to construction. To assure minimum disturbance to the environment, problems must be identified during these surveys and assessments and engineering solutions must be developed.

- **Engineering:** Engineering and design of road projects must identify and mitigate drainage problems, soil erosion, channel erosion, and other environmental impacts. Road improvements in sensitive areas must minimize impacts to the surrounding environment such as minimizing R.O.W. width to minimize disturbance to archeological resources, and plant and animal communities (e.g.., N7 from Canyon De Chelly to Sawmill).
- **Environmental Studies:** The R.O.W. clearance process is a crucial element in identifying and protecting cultural and environmental resources. Sound and complete archeological and environmental studies should be completed for all construction. These studies should be structured to include strong and useful alternatives for protecting cultural and environmental resources or mitigating a project's impacts on them. Based on past Navajo IRR budget, the estimated need for project environmental and archaeological assessments are $100 million for 20 years or $5 million per year.

Other Resources Issues

Aggregate and water resources costs for road construction on the Navajo Nation have become more and more expensive. Great distance between projects, availability and transportation of construction materials all contribute to the high cost.

Aggregate Resources

In 2005 the Division of Natural Resources Minerals Department completed the survey and mapping of all aggregate resources on the Navajo Nation. The findings show that the Navajo Nation has aggregate resources that make available for road construction and maintenance. These aggregate resources are scattered throughout the Navajo Nation.

Water Resources

Well water is the source of water used in road construction. In general, contractors will drill a well near the road construction site. For the most part of the Navajo Nation, groundwater is available and this is preferred practice than the costly hauling of water to the construction sites.

Groundwater is found in four major aquifers underlining the Navajo Nation: 413, 290, 50 and 1.18 million acre-feet are estimated water storage capacity for Coconino, Navajo, Dakota and San Juan Aquifers. Also available are alluvial aquifers underlining many of the washes on the Navajo Nation. Drilling depth is ranging from 200-1000 feet deep. For the most part of the Navajo Nation, contractors can drill a 200-foot deep well for road construction usage except in the farther west of the Western Navajo Agency and a certain area within the Chinle Agency.

Implementation Strategies

To address the Navajo Nation's long range transportation needs, the 2009 LRTP recommends planning and implementation strategies. These strategies should be adopted and meticulously followed by Navajo Indian Reservation Roads transportation decision-makers at all levels. Decision-makers should set long-term and short-range road improvement goals and objectives to meet these needs. Long-term and short-range road improvement planning and prioritization criteria must have the same objective of meeting the transportation needs and goals.

The 2009 LRTP also recommends seeking other sources of funds to supplement the Indian Reservation Roads. Those funding sources are listed in the Funding Strategies subsection.

Long Range Goals and Objectives

To address the Navajo Nation's long range transportation needs and issues, the long range planning and implementation of the Navajo-BIA road improvements must address and include the following long range goals and objectives as follows:

- Upgrade roads to meet design standards and management system requirements to correct deficiencies as well as to improve overall network connectivity, travel mobility and accessibility.
- Improve travel safety and reduce accidents on the Navajo-BIA roads.
- Meet existing and future transportation needs in order to promote community and economic vitality.

Funding Strategies

To meet the Navajo-BIA roads' long range transportation needs, the Navajo Nation's transportation decision-makers must explore all avenues to increase funding of Navajo-BIA road long range improvements. The 2009 LRTP recommends the following strategies:

- Seek to increase the Navajo IRR funding level through lobbying. Under the Federal Lands Highway Program, IRR Program funding needs are factored by population and development growth (through ADT) unlike other FLHP programs, (i.e., Park roads and Parkways, Public Lands Highway Discretionary, Forest Highway and Refuge Roads). These other FLHP roads do not carry the high levels of daily traffic that wear out roads at greater rate: their road miles and traffic volumes are relatively constant. Legislative formula should be established to allocate funds among FLHP programs based on actual needs, instead of each program's relative share.
- Seek funding from the IRR Nationwide Bridge Priority Program to help meet the Navajo IRR bridge improvement needs.

- Seek other funding sources such as the Indian Highway Safety Program ($1.1 million annually) federal Hazard Elimination Program ($550 million annually) which funds safety improvements on highways administered by State and the BIA.
- Seek other funding sources such as Public Land Highway Discretionary Funds for Navajo scenic byways projects and/or State Transportation Enhancement Fund for bicycle and pedestrian paths.
- Seek state/federal share of funding for improvement of Navajo-BIA routes to be used as detours during I-40 emergency closures.
- Use the Navajo Nation Fuel Excise Tax to supplement the IRR funds.
- Fund projects according to project/need priority.
- Taxing: Currently, Kayenta is the only primary growth center with a self imposed sales tax of 2.5 percent. It is recommended that the primary and secondary growth center communities work with the Division of Economic Development to identify and implement self funding mechanisms to aid in enhancing infrastructure investment, ultimately improving economic development opportunities for those that wish to invest within Navajo Nation. The funding opportunities that are identified should be integrated into the ARCs and overall strategic Implementation Program for any recommended transportation improvements within the communities. This provides an opportunity for community, Agency, and ultimately Nation buy-in for ultimate investment and community growth.

These funding strategies should be included in the transportation element policy framework of the Kayenta Comprehensive Plan.

Master Planning

The 2009 LRTP directs each Primary and Secondary Growth Center, including Kayenta Tonship, to develop a community 20-year plan that examines future land use, multi-modal transportation needs, infrastructure needs, environmental considerations and unique characteristics of the community.

The future land use map should examine the type, density, distribution and locations of land uses throughout the growth center, and be balanced with the anticipated infrastructure/transportation needs to accommodate the additional growth. The layout of each growth center has a direct correlation to the amount of infrastructure investment, economic development potential, and ultimately the community context and livability that is equated to the quality of life for the growth center residents.

The 2009 LRTP is a needs-based plan. It considers the existing transportation system and facilities and identifies current and future needs based on socioeconomic and transportation projections. The process for analyzing the transportation needs is cumbersome and highly data intensive. The analysis process is currently being undertaken every five years by the Navajo DOT to update the LRTP.

Planning for the Navajo Nation transportation system is a monumental task and requires the efforts and skills of multiple agencies and the several communities that make up the Nation. Therefore, the LRTP encompasses recommendations and considerations from a variety of planning documents prepared by other agencies. With the contribution from these various groups, these plans should provide a consistent and accurate description of the transportation needs of the Navajo Nation and the opportunities for improvement.

In an effort to streamline the long-range transportation planning process and to provide increased flexibility, it is recommended that the Navajo Nation consider producing Comprehensive Plans at an Agency level, as well as at the Growth Center level. This would allow for bottom-up transportation planning that will build upon the efforts of the prior plan. The growth center plans would feed into the agency plans, and agency plans would feed into the LRTP.

Community plans would incorporate a land use element as well as a transportation element. There is a strong relationship between land use and transportation: they are directly related. The issue of population growth and resulting transportation needs should be addressed cooperatively to effectively identify and implement improvements.

Land use planning efforts are already being undertaken at many of the primary growth centers. Kayenta is currently preparing its Comprehensive Plan. These future land use plans are serving to accommodate the future growth trends of the communities. To support these plans, each will require an associated transportation system plan. The transportation and land use plans may be developed with close coordination from the public to specifically identify the needs of the community and capture the vision of that particular growth center.

Agency level planning would allow for the comprehensive planning of an entire Agency's land area, including the primary and secondary growth centers, and the supporting transportation system. The specific transportation needs and priorities of each agency could be highlighted within its plan. This would allow each Agency to develop its own vision for future development and focus its efforts on the needs it feels are most important to serving its communities and future needs.

For example, one Agency could envision it strength is in serving future tourism needs and providing services that will promote and sustain those efforts; while another Agency will value community connectivity and wants to focus on the needs of all-weather access to its residents. Each agency would be able to develop a list of prioritized transportation projects that reflect their vision for the future.

The prioritized list of projects from each Agency plan's transportation element could then be provided to the ARC for incorporation into the nation-wide LRTP. In developing the Navajo Nation's prioritized list of transportation projects, the ARC would need to remain cognizant of the individual goals of each Agency and treat them as relatively important, based on the Agency's prioritization.

Other considerations that should be included in master planning efforts could include topics such as:

- Drainage improvements
- Energy corridors
- Freight movement
- Environmentally sensitive areas (cultural/historic/archeological, wildlife, etc.)

Title VI and Environmental Justice Implications

Transportation projects that utilize United States federal aid are required to certify non-discrimination under the requirements of Title VI of the Civil Rights Act of 1964. Also, in 1997, the U.S. Department of Transportation issued *DOT Order to Address Environmental Justice in Minority Populations and Low-Income Populations* to summarize and expand upon the requirements of *Executive Order 12898 on Environmental Justice*.

In accordance with the intent of these federal requirements, a preliminary assessment was completed for the 2009 LRTP plan to identify impacted minority and low-income populations within the Navajo Reservation area and any affects to those populations by proposed transportation improvements.

Coordination with DOT

The Navajo Nation has 10,076 miles of roadway, including approximately 1,678 miles of state routes that provide the primary routes between growth center communities and Navajo Transit System routes. The Arizona, New Mexico and Utah departments of transportation must be true partners to invest in roadway and safety improvements on the state system within Navajo Nation. Understanding that DOTs must balance the needs of the state highways within Navajo Nation with the needs outside of Navajo Nation, and with shrinking budgets, the need for additional coordination between the Navajo Division of highways within Navajo Nation is key.

Understanding the State Transportation Improvement Program cycles, each state's process for project prioritization and areas of investment are crucial for a true partnership. Each state has individual goals, just like Navajo Nation.

Based on agency and legislative direction, each state may weigh safety improvements, maintenance, freight, multi-modal or capacity improvements differently based on their programs. Because of this, common reoccurring coordination between the Navajo Division of Transportation and the state DOTs should occur, either in the form of semi-annual or quarterly meetings to ensure that the needs of the various Divisions within Navajo Nation and the state DOTs have a common understanding of needs, priorities and processes.

Additionally, state DOTs generally guide and prioritize projects that are community driven, plan and agency supported. These plan driven requests are those that are supported by Community Plans, programs such as the Safety Improvement Program mentioned above, the Long Range Transportation Plan and other planning processes that show redundancy based on broad-based adopted and accepted support.

Growth Center Mobility Improvements – Kayenta Township

Kayenta had a population of 4,922 in 2000 and is expected to grow to 10,323 by 2030. Kayenta is the only Navajo community that has become a township. Its economy is tied to Monument Valley, a national and international tourist destination. Kayenta collects its own sales tax, passes laws and enforces its land use plan and ordinances. The first Kayenta land use plan was developed and approved in 1986. The township covers approximately 5.6 square miles of land.

US160 and US163 are Kayenta's main thoroughfares. Other existing paved roads are NHA and school access. The junction of US160/US163 has experienced very high levels of crashes. US160 from US163 to N59 and US163 from N6485 to UT state line/Monument Valley also had a high number of crashes.

Kayenta Township has been progressive in establishing a township commission, administration and in planning for development. Land use regulations and development policies have been developed and enforced. With an independent revenue source from its sales tax, Kayenta is likely to be the fastest growing Navajo Nation Growth Center in economic development.

Street Plan Goals and Objectives:

The 2009 LRTP identifies the following goals and objectives for Kayenta Township: (1) Establish a multimodal network that supports the land use plan by providing managed access to different land areas/uses; and (2) Develop an efficient street system that provides a comprehensive transportation network for effective connectivity, distribution of traffic and enhances pedestrian and bicycle mobility. Exhibit ___ shows 2009 Navajo Nation LRTP mobility improvements for Kayenta Township.

Kayenta Township Current Roadway System Conditions

There are only two functionally classified roads serving Kayenta Township, State Highway 163 and State Highway 160. Local streets feed directly from the highway system, some of these being unpaved roads. In addition, there are strip mall commercial and other type of parcels providing direct access to the highway system with little or no connectivity to other modes of transportation, making Kayenta Township highly reliant on automobile. This creates a lack of connectivity and safety concerns. Currently, the Township is applying for the Safe Routes to School Planning Assistance Program. It is critical to the long range viability of the Township to provide guidelines for connectivity and walkability as well as to adopt a safe route to school plan.

Exhibit 15 shows 2009 Navajo Nation LRTP Mobility Improvements for Kayenta Township. Exhibit 16 shows functionally classified roadways serving Kayenta Township.

EXHIBIT 15: 2009 Navajo Nation LRTP Mobility Improvements for Kayenta Township

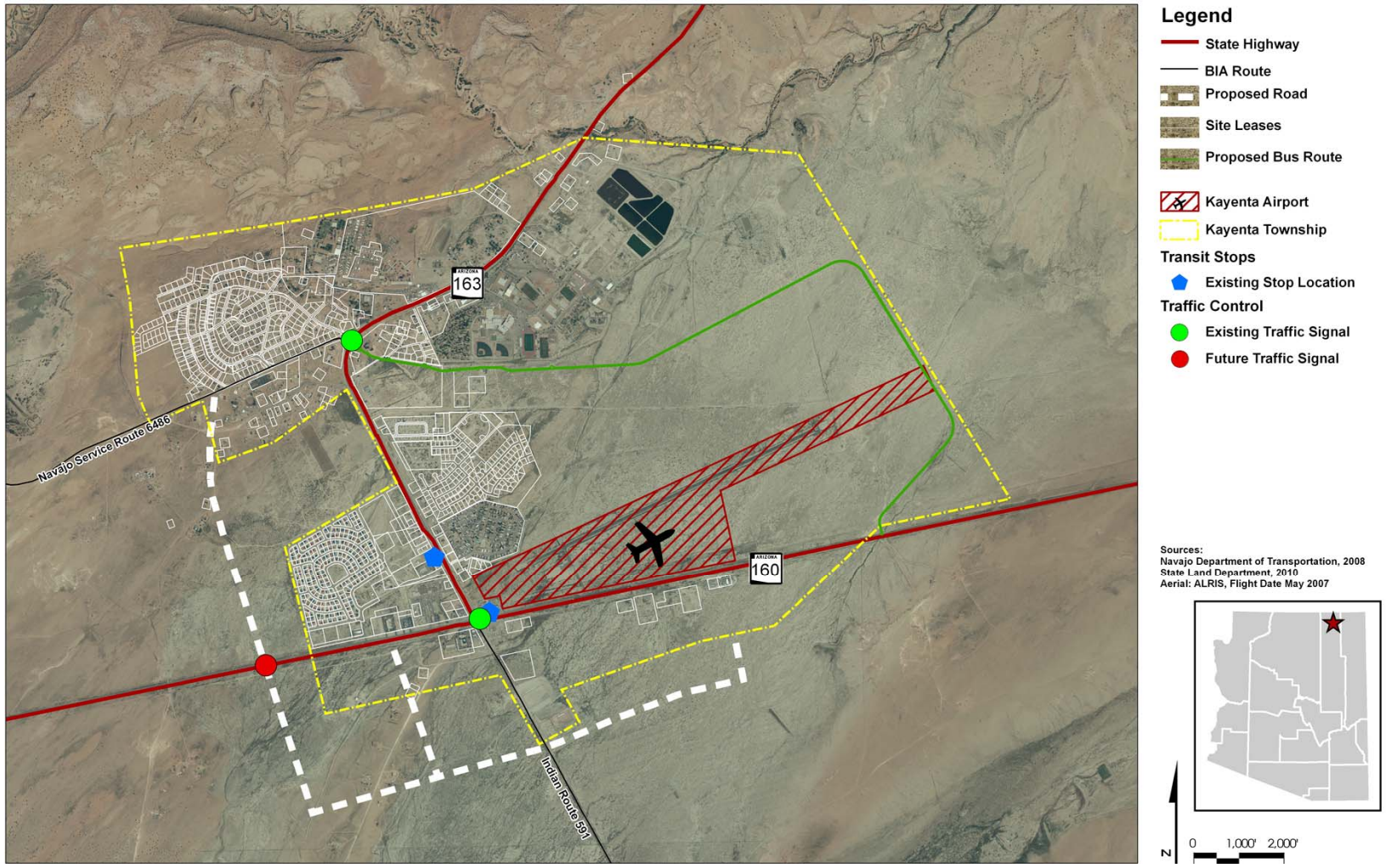


EXHIBIT 16: Existing Roadway Functional Classification

Existing Railroad and Train Services

The Burlington Northern Santa Fe (BNSF) Railroad, a transcontinental railway that connects Los Angeles to Chicago, crosses northern Arizona and New Mexico. The BNSF rail line generally runs east-west just south of the Navajo Reservation boundary except in Arizona through the Nahata Dziil (New Lands) Chapter area, and in New Mexico through the Church Rock Chapter and checkerboard area in the Eastern Navajo Agency, where the BNSF line runs on the reservation.

The Black Mesa and Lake Powell (BLKM) Railroad operates within the western potion of the Navajo Reservation for the sole purpose of transporting coal from a strip mine at Black Mesa to the Salt River Project Navajo Generating Station near Page, Arizona. The generating station provides power to three southwestern states.

Passenger Rail Service

Passenger rail service is provided by Amtrak on the BNSF Railroad line. Amtrak stations closest to the Navajo Nation are in Gallup, New Mexico and in Winslow and Flagstaff, Arizona. Flagstaff had the highest passenger stop/boardings of 39,723 in 2008, while Winslow had 4,767 and Gallup had 12,517. In comparison and based on information in the 2003 LRTP, Flagstaff had the highest passenger stop/boardings of 54,200 in 1993 of 109,700 total passengers boarding in Arizona At the time that figure was anticipated to reach 172,000 by the year 2015, a 57% increase.

Freight Rail Service

Freight service on the BNSF Railroad also stops in Gallup, Winslow and Flagstaff. In 2005, approximately 135,000,000 tons of freight moved by rail in Arizona.4 This compares to 175,000,000 tons in 1993 which at that time was estimated to increase to 275,000,000 tons by 2015. This includes material shipped in crates and containers and bulk materials such as coal, copper ore, and liquids. The 78-mile BLKM Railroad was constructed in 1972 it is isolated and not connected with any other railroad; and it and hauls 8.4 million tons of coal annually. There is a tribal plan to build rail freight access at New Lands for economic development. However, the project is only conceptual. Information on proposed railroad needs is referenced in Chapter 5, NEED 9-Railroads.

Kayenta Airport

Kayenta Airport is a public-use general aviation airport located two miles (3 km) southeast of the central business district of Kayenta, in Navajo County, Arizona. One of the airport's main objective is to serve as a medical evacuation facility.

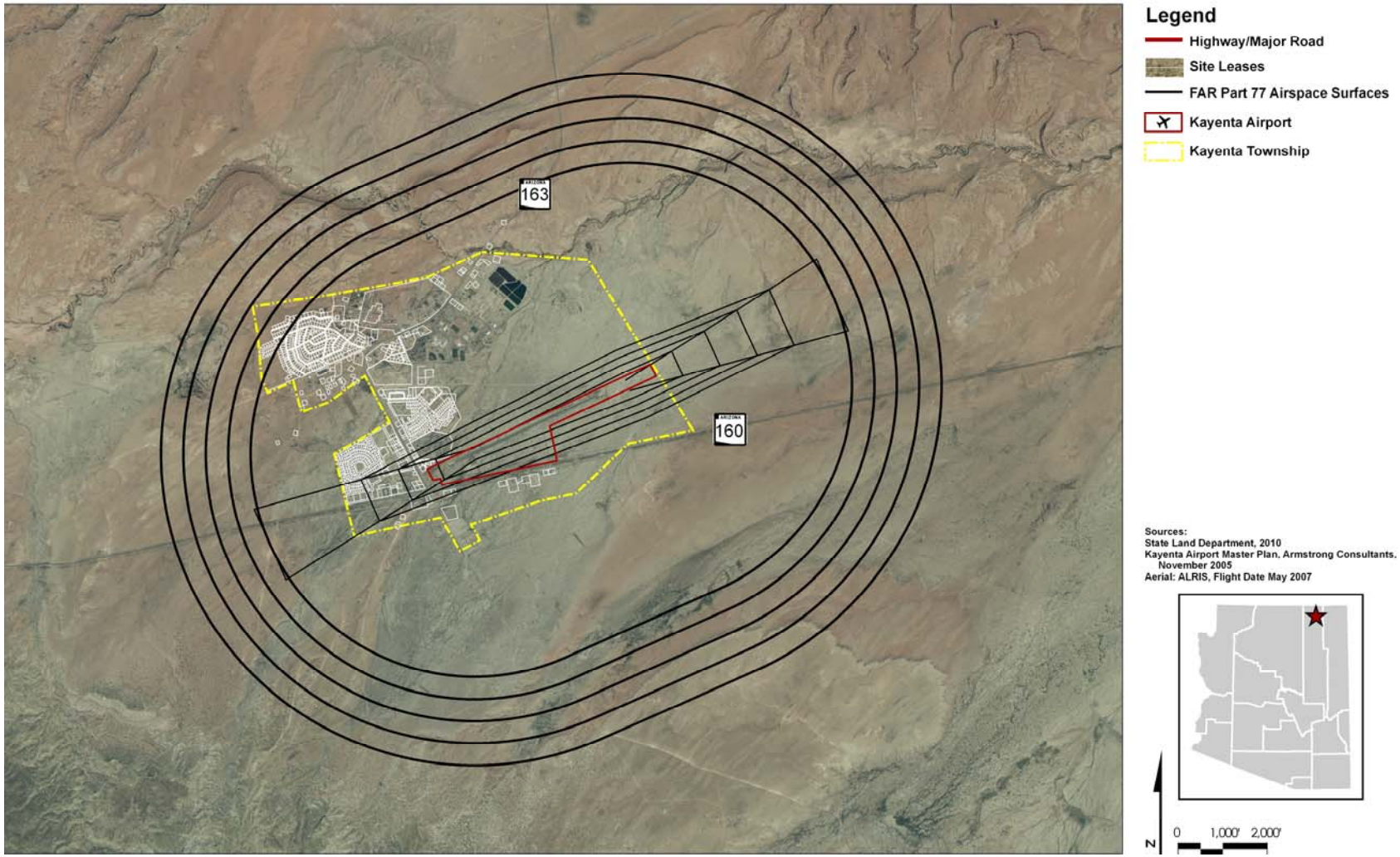
As per Federal Aviation Administration records, records, the airport had 584 passenger boardings (enplanements) in calendar year 2005 and 1,535 enplanements in 2006. According to the FAA's National Plan of Integrated Airport Systems for 2007–2011, Kayenta is a general aviation airport. The commercial service category requires at least 2,500 passenger boardings per year).

The Kayenta Airport is one of six airports owned by the Navajo Nation. The other five are Chinle Airport (E91), Tuba City Airport (T03) and Window Rock Airport (RQE) in Arizona, plus Crownpoint Airport (0E8) and Shiprock Airport (5V5) in New Mexico.

Facilities and Aircraft

Kayenta Airport covers an area of 140 acres (57 ha) and contains one asphalt paved runway designated 5/23 and measuring 7,140 x 75 ft (2,176 x 23 m). For the 12-month period ending May 4, 2007, the airport had 2,000 aircraft operations, an average of 5 per day. Of this total, 75 percent general aviation and 25 percent air taxi. Exhibit 17 shows Kayenta Airport.

EXHIBIT 17: Kayenta Airport Accident Potential Zones and FAR Air Space Surface



Kayenta Economic Base

This chapter is based on best available data available at the time of preparation of this Comprehensive Plan. Such data includes the study *Economy of the Kayenta Area*, prepared in January 2008 by the Center for Competitiveness and Prosperity Research L. William Seidman Research Institute of the W. P. Carey School of Business, Arizona State University, Tempe. The study was prepared for the Arizona Department of Commerce with funding from the Commerce and Economic Development Commission. Data from 2004 was the most recent available data available at the time of preparation of the 2008 study.

This chapter also includes data provided in the *Kayenta Community Profile* prepared by the Arizona Department of Commerce. Data from 2008 is the most recent available data at the time of preparation of the *Kayenta Community Profile*.

In addition, the U.S. Department of Commerce, Bureau of the Census County Business Patterns was consulted in the preparation of this chapter.

Principal Economic Activities in Kayenta

Services and mining comprise the principal economic activities in Kayenta. Peabody Coal Company owns and operates two mines in the area, Kayenta mine and Black Mesa Mine, as well as a central warehouse. The service sector has grown significantly. This scenic area has motels, restaurants, gasoline service stations, convenience stores, curio shops, trading posts, parks and recreational facilities for tourists' enjoyment.

The 44,700-squarefoot Kayenta Shopping Center houses numerous businesses. Table 14shows principal economic activities in Navajo County by employment sector for 2008. Figures shown on this table are organized under the North American Industrial Classification System (NAICS).

Table 14
Navajo County Principal Economic Activities by Economic Sector
2008

County Employment Sector	2008
Educational and Health Services	3,425
Government	10,800
Financial Activities	600
Information	800
Leisure and Hospitality	2,975
Manufacturing	725
Mining and Construction	2,525
Other Services	625
Professional and Business Services	1,225
Trade, Transportation, and Utilities	5,725

Sources: Arizona Department of Commerce 2011

Economy of the Kayenta Area in 2004

The *Economy of the Kayenta Area* study reports coal mining is the primary activity driving the economy of the Kayenta area. Tourism and the federal government also contribute. Government provides the most employment of any sector in the Kayenta area.

According to this study, one zip code (86033) is used as an approximation for the Kayenta area, one of seven unincorporated areas in the Navajo/Hopi region of Arizona. According to the 2000 decennial census, this unincorporated area consists of 1,549 square miles and had 8,491 residents.

Nearly two-thirds of the residents lived in one of three Census Designated Places: Chilchinbito, Kayenta (which had more than 4,900 residents), and Olijato-Monument Valley. The 2004 population of the Kayenta area, as defined by this zip code, was estimated at 9,276.

Total Employment

Total employment in the Kayenta area was estimated to have been approximately 2,300 in 2004. Total employment was only 249 per 1,000 residents. This figure was 42 to 48 percent less than the national and state averages, but considerably more than the median value of 37 Arizona unincorporated areas.

The demographics of residents of the Kayenta area contributed to this low per capita figure. According to the 2000 census, a much lower-than-average share of the residents were of working age (the proportion of children was very high), a much lower-than-average percentage of the working-age population were part of the labor force, and the unemployment rate was very high. However, the number of jobs located in the Kayenta area (in 2001) was more than the 1,775 employed residents of the Kayenta area counted in the 2000 census. Thus, residents of other communities commuted to the Kayenta area to work.

Agriculture and Government

Agriculture largely is a basic activity that includes agricultural support activities as well as farming and ranching. No agriculture employment is estimated to have been in the zip code of the Kayenta area in 2004.

The government sector represents a mix of basic and non-basic activities. Most federal government employment (both civilian and military) is basic to both the community and the state.

State government employment may be basic to the community, but is it not basic to the state. Similarly, county government and community college employment may be basic to the community (for example, a portion of the employment at the county seat is basic in that some workers serve other communities in the county), but not to the county or the state. Other local government, municipal, tribal, school district and special district, only rarely is basic to a community.

Government employment in the Kayenta area in 2004 was approximately 1,075 — by far the highest of the 20 sectors, accounting for 46 percent of all jobs. Government employment per 1,000 residents was 115 in the Kayenta area. This is 43 to 60 percent more than the national and state averages. Excess employment was around 325 relative to the national average and 400 compared to the state average.

The Navajo Nation's workforce in the Kayenta area is roughly estimated to have been between 275 and 300. This includes tribal enterprises, such as utilities. The federal government employed a similar number, with most working for the Indian Health Service or at Bureau of Indian Affairs schools. The federal and tribal employment figures were largely responsible for government's high location quotient. Federal government and the portion of tribal government funded by federal monies can be considered basic. The federal government and the tribe, along with the Kayenta Unified School District (which employed approximately 450), were among the largest employers in the community.

Table 15
Wage and Salary Employment by Sector Kayenta Area (Zip Code 86033)
2004

Sector	Number of Establishments	Employment	Relative to Nation		Relative to Arizona	
			Location Quotient	Excess Employment	Location Quotient	Excess Employment
Total	**61**	**2,310**	**0.52**	**0**	**0.58**	**0**
Agriculture	0	0	0.00	0	0.00	0
Government	6	1,070	1.43	322	1.60	399
Total, Non-agriculture Private Sector	**55**	**1,240**	**0.34**	**0**	**0.38**	**0**
Mining	2	568	38.24	553	44.54	555
Utilities	0	0	0.00	0	0.00	0
Construction	2	8	0.04	0	0.03	0
Manufacturing	0	0	0.00	0	0.00	0
Wholesale Trade	2	4	0.02	0	0.03	0
Retail Trade	11	191	0.39	0	0.41	0
Transportation and Warehousing	2	32	0.25	0	0.28	0
Information	1	14	0.13	0	0.17	0
Finance and Insurance	1	7	0.03	0	0.03	0
Real Estate and Rental and Leasing	3	15	0.22	0	0.21	0
Professional, Scientific and Technical Services	2	8	0.03	0	0.04	0
Management of Companies and Enterprises	1	72	0.80	0	0.77	0

Source: Economy of the Kayenta Area (January 2008) Center for Competitiveness and Prosperity Research L. William Seidman Research Institute, W. P. Carey School of Business,, Arizona State University, Tempe.

Table 15
Wage and Salary Employment by Sector Kayenta Area (Zip Code 86033)
2004
(Continued)

Sector	Number of Establishments	Employment	Relative to Nation		Relative to Arizona	
			Location Quotient	Excess Employment	Location Quotient	Excess Employment
Total	**61**	**2,310**	**0.52**	**0**	**0.58**	**0**
Management of Companies and Enterprises	1	72	0.80	0	0.77	0
Administrative, Support, Waste Management, Remediation Services	1	2	0.01	0	0.01	0
Educational Services	1	32	0.35	0	0.56	0
Health Care and Social Assistance	5	31	0.06	0	0.08	0
Arts, Entertainment and Recreation	1	1	0.02	0	0.02	0
Accommodation and Food Services	11	219	0.64	0	0.62	0
Other Services (except public administration)	8	36	0.21	0	0.28	0
Unclassified Establishments	1	1	0.40	0	0.66	0

Source: Economy of the Kayenta Area (January 2008) Center for Competitiveness and Prosperity Research L. William Seidman Research Institute, W. P. Carey School of Business,, Arizona State University, Tempe.

Notes: Non-agriculture private sector estimated from U.S. Department of Commerce, Census Bureau, Zip Business Patterns 2004. Agricultural production employees, most government employees, railroad employees, self-employed individuals and employees of private households are not included in this data source. The agriculture and government sectors are estimated. The concept of establishment for agriculture and government differs from that used for the non-agriculture private sector.

Non-Agricultural Private-Sector Economy

Non-agriculture private-sector employment in the Kayenta area was approximately 1,250 in 2004. Employment was only 134 per 1,000 residents. This is 62 to 66 percent less than the national and state averages, but more than the median value of the unincorporated areas.

Employment estimates for 2004 for the broad sectors of the Kayenta area economy are shown in Table 15. Other than government, the mining sector provided the most employment. In addition to government, per capita employment was above the national average in the mining sector (see the "location quotient relative to nation" column of the table).

Mining employed substantially more than if the sector's per capita employment had been equal to the national per capita average (see the "excess employment relative to nation" column of the table). Mining is an important export activity.

Per capita employment was far below the national average in other largely basic sectors, including agriculture, manufacturing, wholesale trade, and transportation and warehousing. Tourism had some presence in the Kayenta area with per capita employment 26 percent higher than the U.S. average in the accommodation sub-sector. However, per capita employment was 48 percent below average in the food services sub-sector. Many lodging places have restaurants, which are classified in the accommodation sub-sector. More generally, the location quotient was less than 0.5 in 16 of the 20 sectors, and below 0.25 in 13 of these.

More sectorally detailed data show that six industries provided excess employment of at least 15 in the Kayenta area, five of which have a basic component. By far the most important was the coal mining industry, which in 2004 consisted of one establishment with between 250 and 499 employees and another with between 100 and 249 employees, according to the Census Bureau. These were the two largest private-sector establishments in the area. Local sources report that both of these are Peabody facilities. Pipeline transportation is a related industry, with one employer (Black Mesa Pipeline) of between 20 and 49 in 2004.

Tourists impact the other three industries with excess basic employment, including the hotels and motels industry. The gasoline stations and restaurants industries are partially basic since some of the customers are tourists or other nonresidents passing through the area. Thus, coal mining was the primary activity driving the economy of the Kayenta area. Tourism and the federal government also contributed.

Kayenta Area and Comparison Areas

Employment per 1,000 residents in the Kayenta area in 2004 was 16 percent more than the regional average. The area's per capita employment was the third highest in the Navajo/Hopi region, behind the Fort Defiance-St. Michaels-Window Rock and Chinle areas. In the non-agriculture private sector, employment per 1,000 residents in the Kayenta area in 2004 was 82 percent more than the regional average. This was the second-highest figure in the region, barely less than in the Fort Defiance-St. Michaels-Window Rock area.

Average nonfarm private-sector payroll per employee in the Kayenta area in 2004 was a very high $47,100. This is 30 percent more than the national average, 47 percent higher than the state average, and 69 percent above the regional average. This was the highest figure in the region and second highest in the state.

The Kayenta area's location quotients in mining, transportation, and management of companies and enterprises were the highest in the region. Kayenta ranked average in the remaining sectors, except for health care and educational services, where it ranked last.

Five nearby or otherwise similar unincorporated areas were selected as comparison areas. Per capita employment in the Kayenta area in 2004 was the third highest of the six areas in this comparison group. Per capita non-agriculture private-sector employment was second highest, after Fort Defiance-St Michaels-Window Rock. Average nonfarm private-sector payroll per employee was the highest of the group.

The location quotient in the Kayenta area was the highest of the group in the mining and transportation sectors and second highest in information and accommodations and food services (where it ranked tied with Chinle). It was among the last in manufacturing.

Changes in the Economy Between 2001 and 2004

Between 2001 and 2004, the Kayenta area's employment fell approximately 300 (12 percent), but this is based on rough estimates of the employment by the Navajo Nation. Employment per 1,000 residents dropped, as did the location quotients relative to the national and state averages.

The Kayenta area experienced a lesser decrease of 3 percent in nonfarm private-sector employment between 2001 and 2004, compared to the regional gain of 9 percent, the Arizona average of 5 percent, and the barely positive national change. The location quotient relative to the national average fell 0.02 between 2001 and 2004 in the Kayenta area, similar to the decline in the state's location quotient; the regional average advanced marginally.

The area's employment growth was accompanied by a slight increase in inflation-adjusted payroll per employee. The less than 1 percent rise was a little less than the regional average but better than the decreases in the state and national averages. Some of the sectoral location quotients changed substantially between 2001 and 2004. Large gains were registered in mining and management of companies. In contrast, the location quotient in the accommodation and food services sector fell, due to the hotels and motels industry.

Labor Force Data Kayenta Township

Table 16 shows labor force data for Kayenta Township based on Arizona Department of Commerce and U.S. Bureau of the Census.

Table 16
Navajo County Principal Economic Activities by Economic Sector
2008

Labor Force Data	1990	2000	2008
Civilian Labor Force	1,175	1,554	1,813
Unemployment	37	189	274
Unemployment Rate (percent)	3.1	12.2	15.1

Sources: Arizona Department of Commerce 2011

The U.S. Bureau of the Census Bureau's Population Estimates Program estimated a labor force for Kayenta of 1,551 for the year 2009. This figure shows a decrease in civilian labor force of 262 people from the total 1,813 reported in the 2008 estimates shown on Table 16. Since unemployment and unemployed rate estimates are not currently available for the year 2009, it is hard to make an assessment. However, such decrease in labor force from 2008 to 2009 may be attributed to the current economic climate. An update of the Economy of the Kayenta Area prepared in 2008 and based on 2004 data is recommended.

Currently, major development within the Township includes a prison and a major health care center. These two developments will generate additional employment within the Kayenta Township.

The *Chinle-Many Farms and St. Michaels-Window Rock for Defiance Multimodal Long Range Transportation Study,* which includes the Kayenta Township area, spearheaded by the Arizona Department of Transportation (ADOT) is anticipated to run concurrently with this Comprehensive Plan planning process. The scope of work of this study includes an inventory of current conditions. Such study includes an assessment of demographics and socioeconomic characteristics. The results of such assessment will feed the policy framework of this Comprehensive Plan.

Economic Development Strategy

It is anticipated that government, trade, transportation and utilities, education and health services, leisure and hospitality and mining will continue to be the primary sources of employment.

A successful place-base economic development strategy for Kayenta Township is needed in order to sustain the long-range viability of the township. Such economic development strategy must consider all the placemaking components needed to make Kayenta a destination. It must take into consideration:

- Employment diversification
- Ecotourism (available natural resources)
- Heritage tourism (available cultural resources, including Navajo-centered arts, crafts, music, performing arts, film making, story telling, festivals, healing and spiritual practices
- Emerging clean technologies (potential for solar, wind and other alternative energy)
- Contained farming (green-house based agriculture with lower land and water usage)

Destination Kayenta

Twenty-seven miles north of Kayenta is the Navajo Nation's most famous attraction, Monument Valley Tribal Park. Betatakin, Navajo for "houses in rock shelves," and Keet Seel Ruins are about 20 miles away. The Four Corners area, a junction of Arizona, Utah, Colorado and New Mexico (the only spot in the United States where four states meet) is less than 80 miles away.

Within a 150- mile radius are a variety of parks and recreational facilities: Grand Canyon National Park, Glen Canyon National Recreation Area, Lake Powell and Glen Canyon Dam on the Colorado River. The prehistoric Indian dwellings of Canyon de Chelly National Monument and the monoliths and arches of Monument Valley, Rainbow Bridge National Monument and the Navajo Scenic Area are nearby.

Leisure and hospitality is a major economic activity in the township. Taking competitive advantage of eco-tourism and heritage tourism is necessary to make Kayenta a destination.

Cultural or Heritage Tourism

Cultural heritage tourism (or just heritage tourism) is a branch of tourism oriented towards the cultural heritage of the location where tourism is taking place. The National Trust for Historic Preservation defines heritage tourism as "traveling to experience the places and activities that authentically represent the stories and people of the past." It also defines cultural heritage tourism as "traveling to experience the places and activities that authentically represent the stories and people of the past and present."

Culture has always been a major driver for travelers. Cultural attractions play an important role in tourism at all levels, from the global highlights of world culture to attractions that showcase local identities.

Culture, heritage and the arts create a sense of destination that lures tourists. In recent years 'culture' has been rediscovered as an important marketing tool to attract those travelers with special interests in heritage and arts. Cultural heritage tourism is one of the fastest growing segments of the tourism industry today.

This is correlated to an increase specialization among tourists. This trend is evident in the rise in the volume of tourists who seek adventure, culture, history, archaeology and interaction with local people.

In addition to serving as an economic engine, Cultural heritage tourism has a positive economic and social impact, it establishes and reinforces community identity, it helps preserve the community cultural heritage, and it enriches the human experience by facilitating harmony among a variety of groups.

Cultural heritage tourism has a number of objectives that must be met within the context of sustainable development. These include the conservation of cultural resources, accurate interpretation of resources, authentic visitor experience, and the stimulation of the earned revenues of cultural resources. Therefore, cultural heritage tourism is not only concerned with identification, management and protection of the heritage and cultural values but it must also be involved in understanding the impact of tourism on communities and regions, achieving economic and social benefits, providing financial resources for protection, as well as marketing and promotion.

Cultural or heritage tourism and ecotourism feed each other. Hence, it is necessary to embrace an integrative economic development strategy that markets these two complementary economic activities. Low cost programs such as art studio space, arts and crafts markets and guided horse or jeep tours can be used to lure visitors. The revenue generated by such low cost programs, may be used to generate larger projects such as RV parks for visitors, resorts, healing spas and so on.

Sustainable Ecotourism

The tourism industry defines sustainable eco-tourism as "environmentally responsible travel to relatively undisturbed areas, to enjoy and appreciate nature and accompanying cultural features and to become aware of the need for preserving natural capital and cultural capital. Ecotourism should have low visitor impact and should contribute to the well-being of local populations." Many global environmental organizations and aid agencies favor ecotourism as a vehicle to sustainable development.

Sustainable ecotourism must satisfy the following criteria:

- Conserve, protect and preserve biological diversity and cultural diversity through ecosystem protection;
- Promote sustainable use and best practices of biodiversity by providing jobs to local populations;
- Share socio-economical benefits with local communities and by having their informed consent and participation in management of ecotourism business;
- Increase awareness and knowledge of environmental and cultural resources;
- Minimize tourism's own environmental impact; and
- Promote affordability

For many communities, ecotourism is not so much seen as a marginal activity intended to finance protection of the environmental infrastructure than as a major sector of national economy and as a means of getting currencies. For example, in countries such as Kenya, Ecuador, Nepal, Costa Rica, and Madagascar, ecotourism represents a significant chunk of foreign revenue.

Critics claim that ecotourism as practiced and abused often consists in placing a hotel in a splendid landscape, to the detriment of the ecosystem. Ecotourism must above all sensitize people with the beauty and the fragility of nature. Using the label of "eco-tourism" and "green-friendly", while behaving in environmentally irresponsible ways is not conducive to sustainability. Policy direction for the establishment of sustainable best practices is necessary to ensure that the environmental infrastructure and the long-range sustainability of the township are protected.

Emerging Clean "Green" Technologies

Setting an example, Kayenta was the fourth community in the country to adopt the International Green Construction Code. As a result, the community has been asked to join a work group being facilitated by the International Code Council (ICC) to assist other communities in the nation in the adoption and enforcement of this code. Nationwide, government initiatives are creating growth in the green industry. With a projection of five million new green jobs in the next decade, embracing today's emerging technologies could be the pathway to a stable, rewarding and a sustainable economy.

The federal government is funneling funds to solar and wind generation, as well as weatherization and climate change programs. The U.S. Green Building Council, Leaders in Energy and Environmental Design (LEED) is providing a concise framework for identifying and implementing practical and measurable green building design, construction, operations and maintenance solutions.

With increased public awareness and available government funding, more and more people are turning towards careers in today's emerging green technologies.

Several hundred cities and local governments around the world are actively planning or implementing renewable energy policies. This means that the demand for qualified professionals is going to grow even further. Sustainable building, solar PV systems and other renewable energy fields will provide the pathway to a solid, reliable, and sustainable future that makes a difference every day. It is important for the Township to embrace these new technologies to create a sustainable economy.

Solar Power

In a world where demand for energy is growing as non-renewable supplies are diminishing, many nations are rapidly developing renewable energy sources as a way to secure their future energy demand. In 2008, the world's solar photovoltaic market installations reached a record high of 5.95 Gigawatts, representing growth of 110% over the previous year.

Europe accounted for 82 percent of world demand, while Spain's growth of 28.5 percent pushed Germany into second place in the market ranking. The United States advanced to number three, and rapid growth in Korea allowed it to become the fourth largest market, closely followed by Italy and Japan.

Even with these tremendous growth increases, cumulative solar energy production accounts for less than 0.01 percent of total Global Primary Energy demand. As technology for solar energy advances and the costs are lowered, research has confirmed that the Asia Pacific, European and United States are projected to have strong growth over the next five years.

Resulting from the increasing attraction of solar energy as the world's future primary energy source, global, national, state and local organizations have launched campaigns to help bring solar energy development into the next century. These organizations advance energy efficiency, promote renewable energies, and provide research and policy analysis in solar energy technologies.

In 2010, the US Bureau of Land Management (BLM) launched an aggressive program to build large scale solar generating fields on BLM owned lands within the states of Arizona, California, New Mexico and Nevada.

The National Renewable Energy Laboratory (NREL) recently released a study showing the solar potential of states in the Southwest, and in particular, Arizona. Arizona has long been known for its sunny, dry climate, receiving a total of 296 days of sunshine annually. Although Arizona currently lags behind others in solar energy deployment, the vast natural resource offers tremendous potential in solar energy development and production.

In addition to solar energy deployment-related revenues, solar fields may incorporate research and development in association with a college or university research campus or station as well as assembly and manufacturing uses fostering technology development from the laboratory to the marketplace. As discoveries are made in research and development facilities, solar energy companies can rapidly move new technologies into the marketplace, providing consumers with up-to-the-minute market-based solutions and communities with additional revenue sources. This combined economic development strategy enhances opportunities for local employment and increases the sustainability of the community.

Utility-Scale Wind Power

Utility-scale wind power in Arizona began in 2009 with the commissioning of the first phase of the Dry Lake Wind Power Project in Navajo County. On February 11, 2010, the National Renewable Energy Laboratory released the first comprehensive update of the wind energy potential by state since 1993, showing that Arizona had potential to install up to 10.9 GW of onshore wind power nameplate capacity, generating 30.6 Terawatt per hour (TWh) annually.

For comparison, Arizona consumed 69.391 TWh of electricity in 2005; the entire U.S. wind power industry was producing at an annual rate of approximately 50 TWh at the end of 2008; Arizona's Palo Verde Nuclear Generating Station produced 26.782 TWh in 2007; and Three Gorges Dam, the world's largest electricity-generating station, produced an average of 80 TWh/yr in 2008 and 2009.

Continue to invest in utility-scale solar and wind power generation facilities will be beneficial to the township as well as to the Navajo Nation.

Land Use Determination

Prior to determining what types of future land use designations are appropriate for a site or community, an extensive analysis of site opportunities and constraints must be conducted to determine the amount of developable land available for development. Such analysis includes detail studies completed in the previous chapters of this document and encompass the following:

- Topography and Land Forms
- Soils Types
- Hydrology, Water Flows and Drainage
- Washes and Riparian Corridors
- Wildlife Corridors and Vegetative Communities
- Community Facilities Needed to Support the Current and Future Populations (Recreation, Parks, Trails, Open Space, Schools, Libraries, Police, Fire Protection, Emergency Management Services)
- Existing Transportation Network Needed to Support the Current and Future Populations
- Utilities and Infrastructure Needed to Support Current and Future (Water, Sewer, Solid Waste, Electricity, Gas, Alternative Energy Sources)
- Existing Airports' Runways, Accident Potential Zones, and Noise Contours.
- Existing Land Use Patterns
- Population projections

Once the opportunities and constraints analysis is completed and maps are generated a report is prepared summarizing all these conditions and identifying areas that can support different types of land uses. This chapter summarizes existing developable land based on an analysis of existing vacant land.

After this stage, planners engage the community in a visioning process to determine what type of development is desired by the community in question. Once the community agrees on a vision statement that summarizes the desires of the community regarding the types of land uses, planners recommend one or few scenarios based on the public input and on the analysis of opportunities and constraints.

Type of land uses varied from community to community as they are tied to site opportunities and constraints, local and regional economic trends, population being served and community desires.

Kayenta Township Existing Land Uses

The developed areas are located in the lower elevations of the watershed. The Kayenta Unified School District and Kayenta Community School complexes include school buildings and housing. U.S. Public Health Service housing, B.I.A. Kayenta Boarding School, Kayenta Chapter House, Kayenta Field house, various commercial facilities and houses located on the "hill" make up the urban development. Industrial land use is at a minimum and commercial land uses account for the majority of the business along the US Highway 163 and 160 corridors. The remaining land areas are parks, public facilities, airport, roadways, and undeveloped land. Table 17 shows acreage for all existing land use categories within the Township. Exhibit 17 shows existing land uses. Exhibit 18 shows commercial uses and retail inventory within Kayenta Township.

EXHIBIT 17: Kayenta Township Existing Land Uses

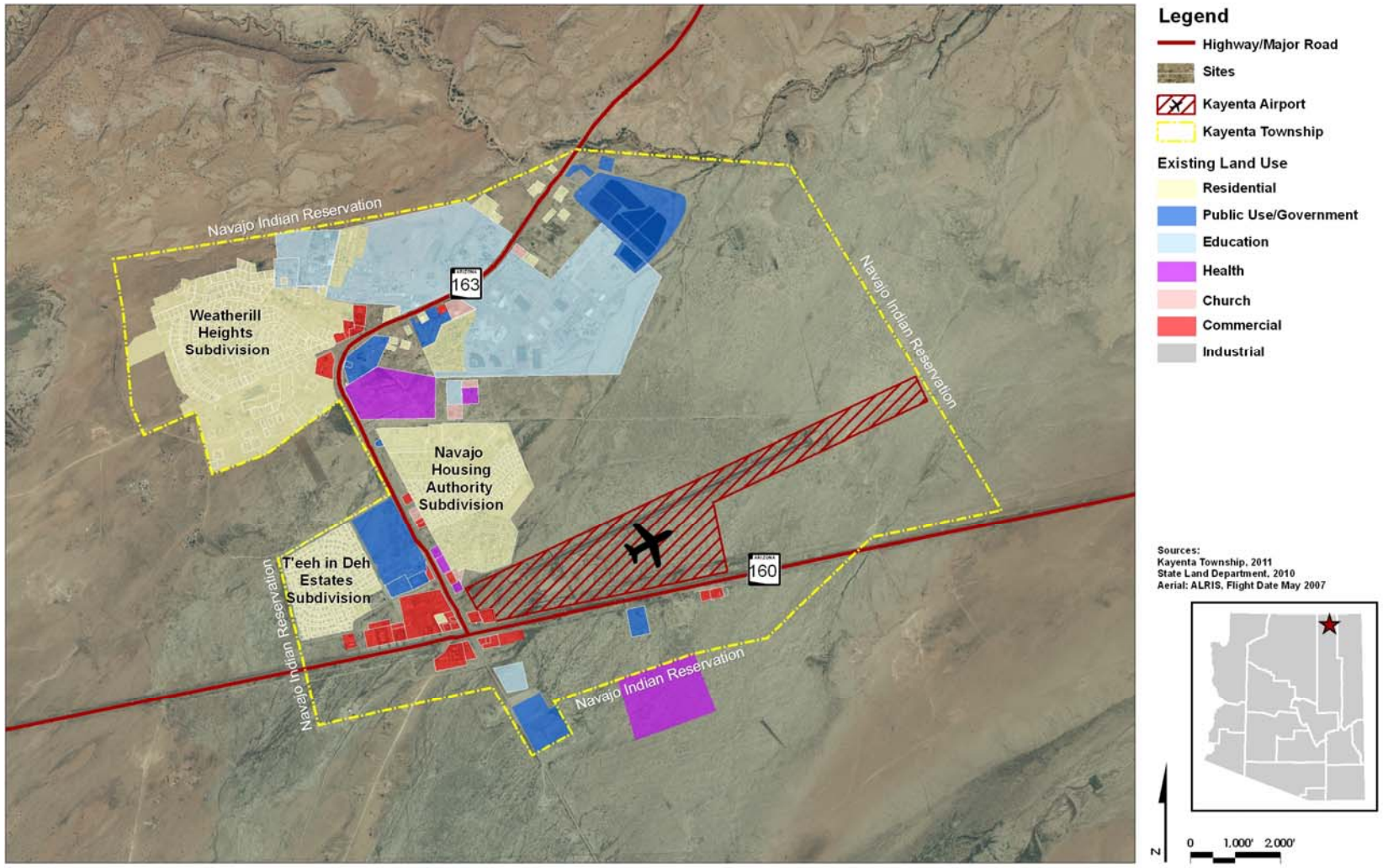


EXHIBIT 18: Kayenta Township Existing Commercial and Retail Uses (Retail Inventory)

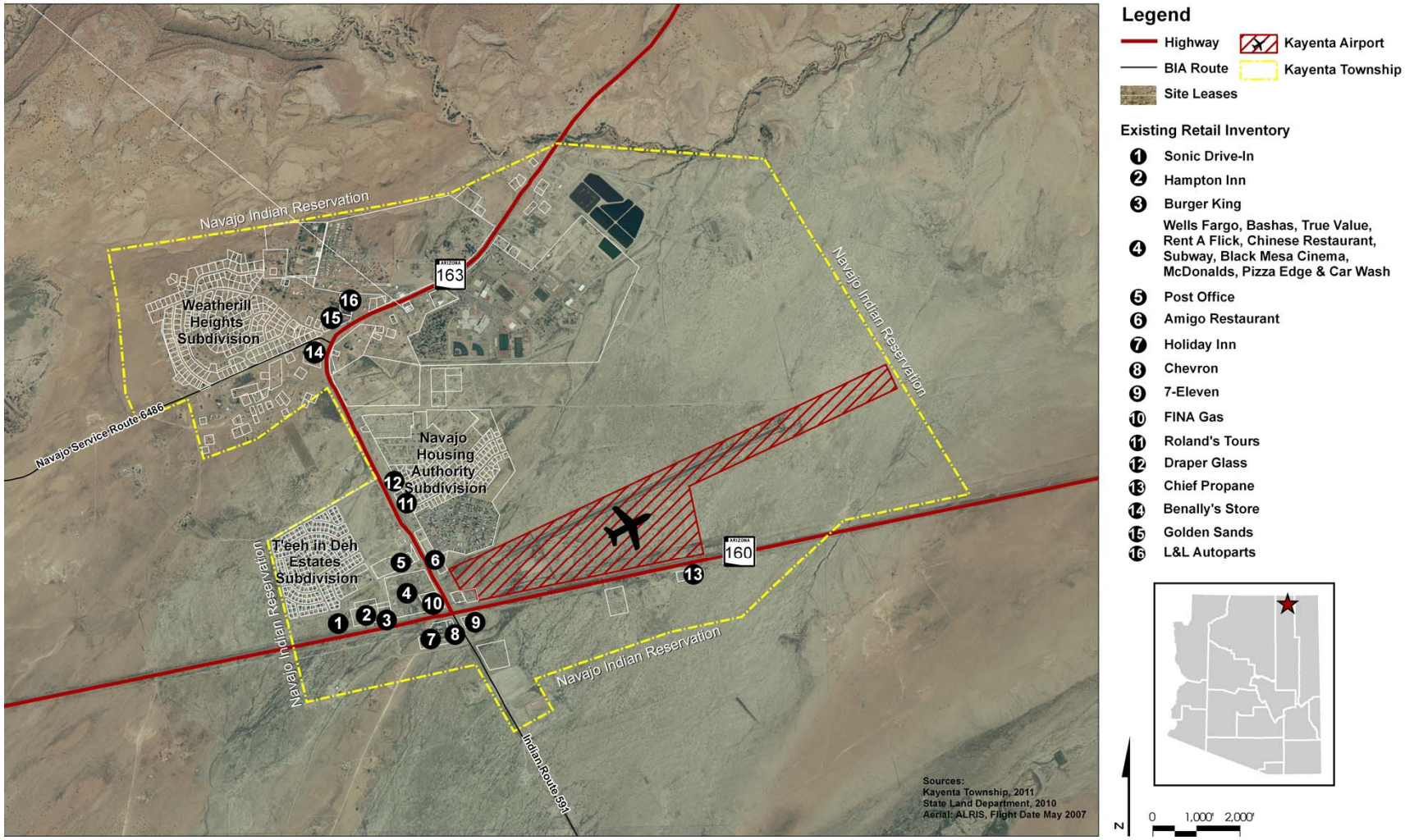


Table 17
Existing Land Uses Within Township Boundary
2011

Land Use	Acres	Percent
Residential	623	17.3
Education	414	11.5
Kayenta Airport	267	7.4
Government	172	4.7
Commercial	70	1.9
Health	50	1.4
Church	11	0.3
Industrial	2	0.1
Vacant	1,995	55.4
Total	**3,604**	**100**

Sources: Existing Land Use Inventory, The Planning Center, 2011

Note: Total does not include 59 acres located outside the Township.

Existing Land Use Analysis

As shown on Table 17, of the total 3,604 acres within the Township, approximately 2,262 acres, or 62.8 percent, are vacant lands and 1,342 acres, or 37.2 percent, are developed lands.

Of the total 3,604 acres within the Township, approximately 623 acres, or 17.3 percent, are residential land uses; approximately 414 acres, or 11.5 percent, are education land uses; approximately 267 acres, or 7.4 percent, are airport uses; approximately 172 acres, or 4.7 percent are government uses, approximately 70 acres, or 1.9 percent are commercial land uses; approximately 50 acres, or 1.4 percent are health care facility uses; approximately 11 acres or 0.3 percent, correspond to churches; approximately 2 acres, or 0.1 percent are industrial land uses; and approximately 1,995 acres, or 55.4 percent correspond to vacant or undeveloped lands.

The new health care facility located outside the Township boundary encompasses 59 acres of land. Parks and recreation are primarily within educational facilities, therefore, a separate acreage for this land use was not provided.

Commercial, Industrial and Retail Uses

In Kayenta Township, existing commercial, industrial and retail uses are primarily located along highway corridors 160 and 163 as shown on Exhibits 18 and 19. An opportunity exists for development a major activity node at the intersection of both highways. Additional opportunities for commercial and industrial development exist in proximity to the Kayenta Airport as provided in conformance with the Kayenta Airport Master Plan.

Analysis of Vacant and Developable Land

Vacant or undeveloped land includes flood prone areas shown on Exhibits 4, Watercourses, Major Washes and Floodplains, provided in the Opportunities and Constraints chapter of this document. Development within floodplain areas needs to conform to all applicable FEMA regulations for development within the floodplains, if the Township decides to pursue flood insurance FIRM status from FEMA.

Opportunities for the development of an integrated trail system along major washes exist along major washes. Table 18 shows analysis of developable lands based on opportunities and constraints analyzed in the Opportunities and Constraints chapter of this document.

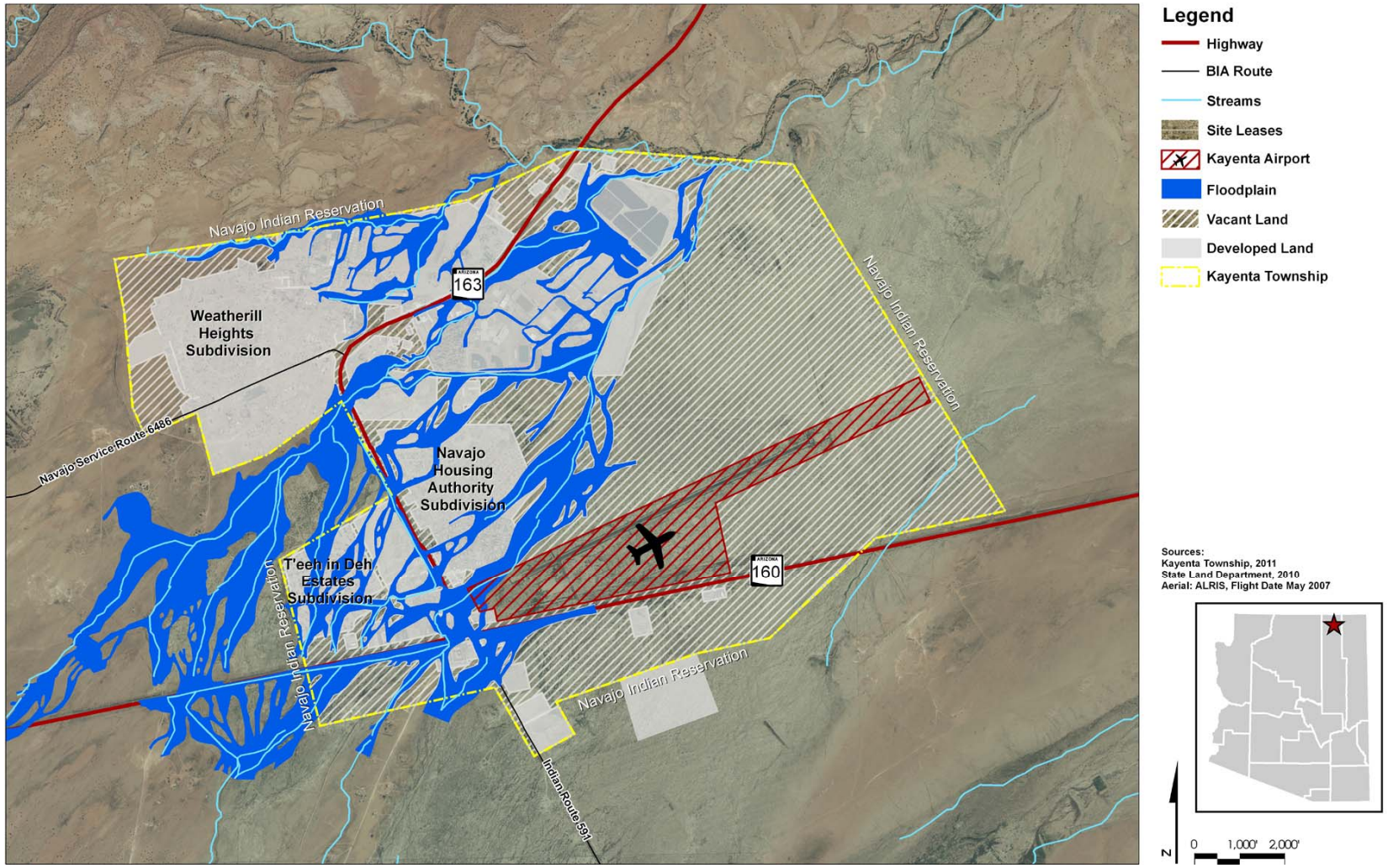
Table 18
Analysis of Vacant and Developable Lands
2011

Land Use	Acres	Percent
Vacant Land Outside Floodplain	1,727	86.6
Vacant Land Inside Floodplain	268	13.4
Total	**1,995**	**100**

Sources: Vacant Land Inventory, The Planning Center, 2011

As shown on the Table 18, of the total 1,995 acres of vacant or undeveloped land, approximately 1,727 acres, or 86.6 percent constitute vacant lands immediately available for development; and 268 acres, or 13.4 percent, includes vacant lands currently included within floodplains. Development within these lands must meet FEMA criteria, if the Township decides to pursue FIRM status with FEMA. Vacant lands within the floodplain provide opportunities for regional trail system and wildlife corridors. Exhibit 19 shows development potential based on this analysis of vacant land.

EXHIBIT 19: Development Potential



Kayenta Township Demographic Profile

Although the decennial census was completed in 2010 by the US Bureau of the Census, the most recent available data for Kayenta Township are the 2008 UA Bureau of the Census population estimates. According to such data, the 2008 population was estimated at 4,694 people. This represents a decrease of 228 persons from the 2000 census counts provided in Table 19.

Table 19
Kayenta Township, Navajo County and Arizona
Population Comparisons1990 and 2000 Counts and
2008 Estimates

Location	1990	2000	2008
Kayenta	4,372	4,922	4,694
Navajo County	77,674	97,470	114,780
Arizona	3,665,228	5,130,632	6,629,455

Sources: 1990 and 2000 Population Counts and 2008 Population Estimates, U.S Bureau of the Census; Kayenta, Community Profile, Arizona Department of Commerce, 2010.

Socio-economic Characteristics

According to the US Bureau of the Census 2005-2009 American Family Survey 5-Year Estimates Data Profile Highlights, the average household size for Kayenta during the 2005-2009 period was 3.72 persons, or 1.12 higher than the U.S. average household size of 2.60 persons.

According to the same source, the average family size in Kayenta was 4.30 persons, or 1.11 higher than the U.S. average family size of 3.19 persons.

Of the total 4,694 population living in households, a total of 2,526 persons, or 53 percent, are 25 years and older. Currently, there is no group quarter population within the Township. The civilian veterans population 18 years or older is 187 persons. Of the total population living in households, 621 persons, or 13.2 percent, are married women 15 years and older and 556 persons, or 11 percent are married men 15 years or older. A total of 3,179 speak a language other than English.

Economic Characteristics

According to the US Bureau of the Census 2005-2009 American Family Survey 5-Year Estimates Data Profile Highlights, the labor force population 16 years and older for this period is 1,551 persons. The median household income in 2009 inflation-adjusted dollars was 35,94 dollars, or 15,476 dollars lower than the 51,425 dollar U.S median household income. The median family income in 2009 inflation-adjusted dollars was 37,116 dollars, or 25,247 dollars lower than the 62,363 dollar U.S. median household income. The per capita income in 2009 inflation-adjusted dollars for the same period was 12,336 dollars, or 14,705 dollars lower than the U.S. per capita income.

Based on the same data source and time period, 26.6 percent of families within Kayenta Township lived below the poverty level compared to the 9.9 percent of families living under the poverty level in the U.S. and 27.4 percent of individuals within Kayenta Township lived under the poverty level compared to the 13.5 percent individuals living under the poverty level in the U.S.

Housing Characteristics

According to the US Bureau of the Census 2005-2009 American Family Survey 5-Year Estimates Data Profile Highlights, there were a total of 1,767 housing units within Kayenta Township. Table 20 shows housing characteristics.

Table 20
Kayenta Township Housing Characteristics
Compared to U.S. Housing Characteristics
2005-2009 Period

Housing Units	Estimate	Kayenta (Percent)	U.S. (Percent)
Occupied Units	1,261	71.4	88.2
Owner-occupied Units	639	50.7	66.9
Renter-occupied Units	622	49.3	33.1
Vacant Housing Units	506	28.6	11.8
Total Housing Units	1,767		

Source: US Bureau of the Census 2005-2009 American Family Survey 5-Year Estimates Data Profile Highlights.

According to the same source and time period, the median value of owner-occupied homes in Kayenta Township is 58,000 dollars, or 127,400 dollars lower than the 185,400 U.S. median value of owner-occupied homes.

Other Demographic Estimates

According to the US Bureau of the Census 2005-2009 American Family Survey 5-Year Estimates Data Profile Highlights, of the total 4,675 population, a total of 2,440 are female and a total of 2,254 are male. The median age in years is 27 compared to the U.S. median age in years of 36.5 years. Table 21 shows age distribution of the Kayenta population during the 2005-2009 period.

Table 21
Kayenta Township Age Distribution
2005-2009 Period

Housing Units	Estimate	Kayenta (Percent)	U.S. (Percent)
Under 5 years	371	7.9	6.9
18 Years and Over	2,947	62.8	75.4
65 Years and Over	177	3.8	12.6
Total Population	4,675		

Source: US Bureau of the Census 2005-2009 American Family Survey 5-Year Estimates Data Profile Highlights.

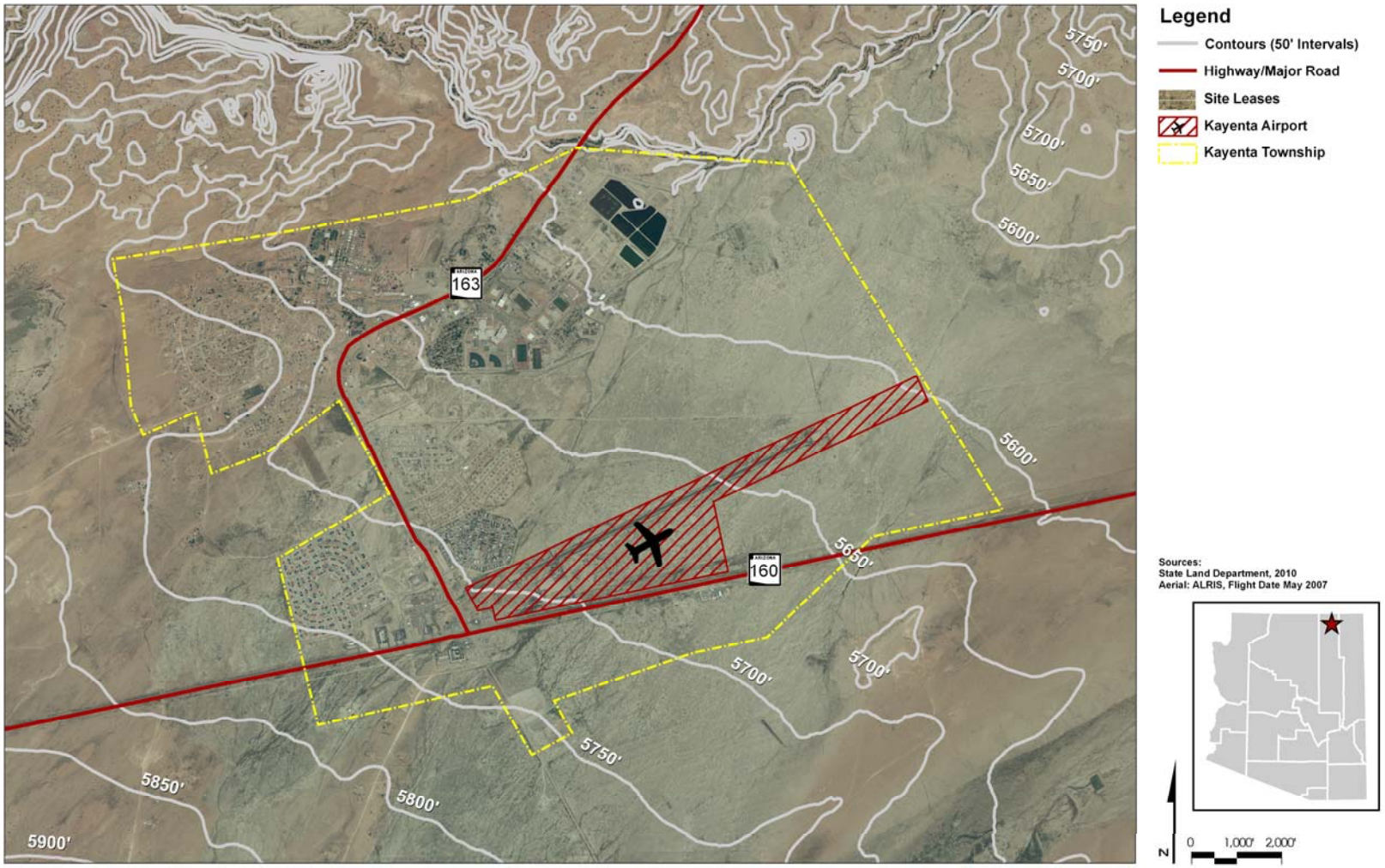
Table 22

Kayenta Township Race Distribution
2005-2009 Period

Housing Units	Estimate	Kayenta (Percent)	U.S. (Percent)
White	342	7.3	74.5
Black or African American	29	0.6	12.4
American Indian and Alaska Native	4,304	91.7	0.8
Asian	0	0.0	4.4
Native Hawaiian and Other Pacific Islander	0	0.0	0.1
Some other race	0	0.0	5.6
Two or more races	19	0.4	2.2
Hispanic or Latino (of any race)	119	2.5	15.1
Total Population	4,675		

Source: US Bureau of the Census 2005-2009 American Family Survey 5-Year Estimates Data Profile Highlights.

As provided in table 22 and according to the US Bureau of the Census 2005-2009 American Family Survey 5-Year Estimates Data Profile Highlights, of the total 4,675 persons living in Kayenta Township, 4,304, or 92 percent, are Navajo people. The remaining 8 percent is primarily composed of white and Hispanic/Latino or any race.


Legend
Contours (50' Intervals)
Highway/Major Road
Site Leases
Kayenta Airport
Kayenta Township
5750'
5700'
5700'
5650'
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5650'
5700'
5700'
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5850'
5800'
5900'
163
160
Sources:
State Land Department, 2010
Aerial: ALRIS, Flight Date May 2007
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Application for Participation in the National Flood Insurance Program (FEMA Form 81-64):

This one-page form asks for the following information:

- Community name
- Chief Executive Officer
- Person responsible for administering the community's floodplain management program
- Community repository for public inspection of flood maps
- Estimates of land area, population, and number of structures in and outside the floodplain

Resolution of Intent: The community must adopt a resolution of intent, which indicates an explicit desire to participate in the NFIP and commitment to recognize flood hazards and carry out the objectives of the Program.

Floodplain Management Regulations: The community must adopt and submit floodplain management regulations that meet or exceed the minimum floodplain management requirements of the NFIP. Follow this link to see FEMA's regulations: www.fema.gov.

For more information about joining the program:
Please read *Joining the National Flood Insurance Program* at http://www.fema.gov/library/viewRecord.do?id=3310

Please contact FEMA Regional Office or the NFIP State Coordinating Agency for information about joining the Program. These offices will provide an application, sample resolution, and a model floodplain management ordinance.

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